



Approach to SOB

By

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ATS Definition of Dyspnea

- Patient self-reported, subjective
- “Breathing discomfort, qualitatively distinct sensations varying in intensity”
- Arises from “interactions among multiple physiological, psychological, social, and environmental factors and may induce secondary psychological and behavioral responses”
- Prefer “breathlessness” as patient-centric

Dyspnea



- Subjective
- Discomfort associated with the act of breathing in circumstances it is unexpected;
- Further characterize by:
 - ◊nature of onset (acute, chronic), duration
 - ◊evolution over time
 - ◊associated symptoms (cough, CP, wheeze, orthopnea)
 - ◊physiologic vs. pathologic
 - ◊quantify (“no SOB” is inadequate)

Caveats re. Dyspnea Evaluation

- Note discrepancy between patient's perception (under-reported) and physician's clinical evaluation (under-recognized);
- Be able to recognize fatigue vs. activity intolerance vs. dyspnea;
- Be aware of natural history of dyspnea in various clinical settings and disease entities;
- Co-existence of multiple causes of dyspnea is common; so need to be able to define relative contribution of lung disease (as opposed to obesity, anemia, LBP);
- Be adept at distinguishing cardiac vs. pulmonary causes of SOB;

Pathogenesis of Dyspnea

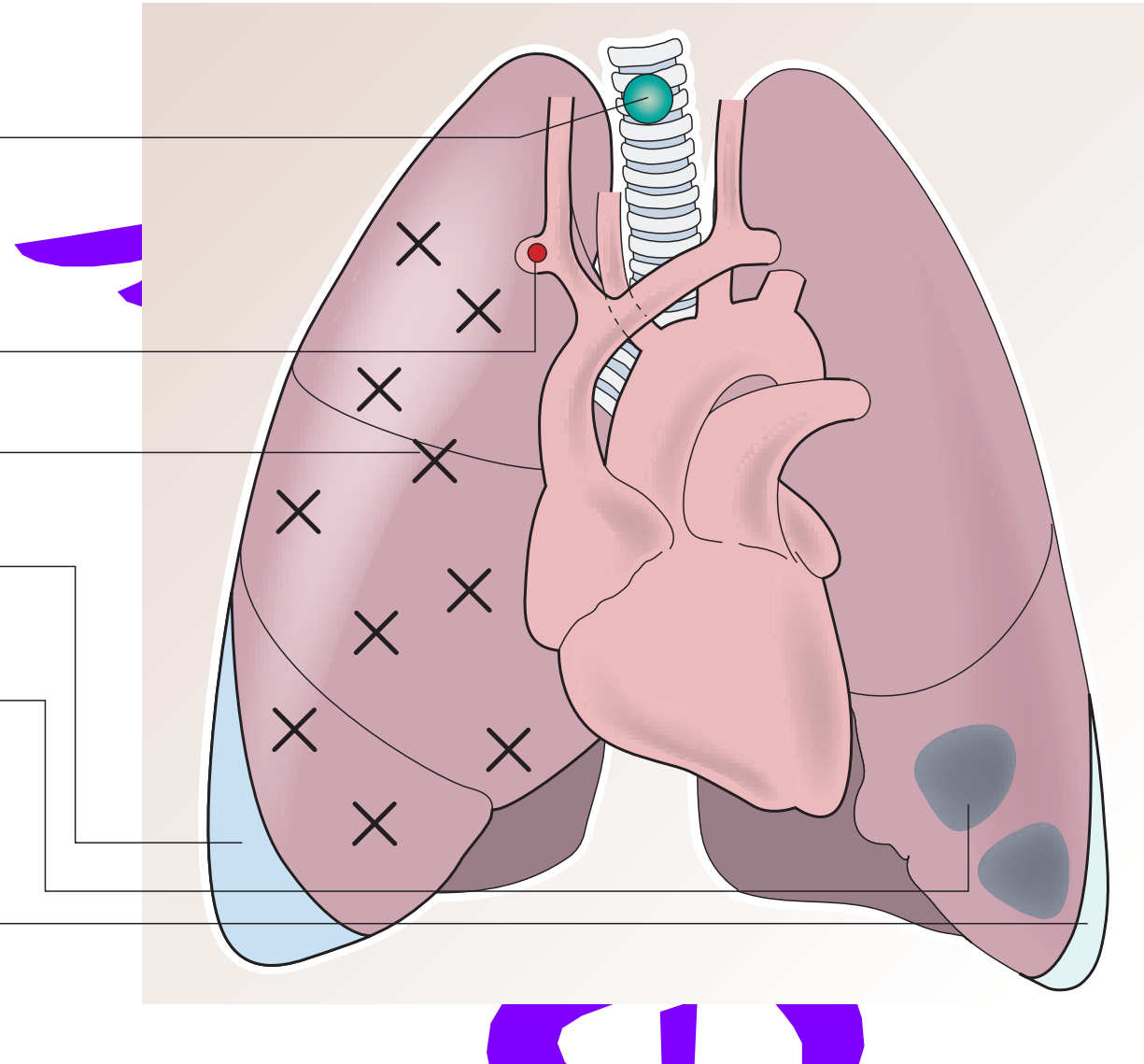
- Dynamic hyperinflation
- Increased ventilatory demand relative to capacity
- Abnormalities in gas exchange
- Inspiratory muscle weakness
- Cognitive & psychological influences (i.e. fear, anxiety)
- Other

Table 3 American Thoracic Society revision of the Medical Research Council dyspnea scale

Grade	Degree	Comments
0	None	Not troubled with breathlessness except with strenuous exercise
1	Slight	Troubled by shortness of breath when hurrying on the level or walking up a slight hill
2	Moderate	Walks slower than people of the same age on the level because of breathlessness or has to stop for breath when walking at own pace on the level
3	Severe	Stops for breath after walking about 100 yards or after a few minutes on the level
4	Very severe	Too breathless to leave the house or breathless when dressing or undressing

Common causes

- Airway obstruction
 - Asthma
 - COPD
- Pulmonary embolism
- Pulmonary oedema
- Pneumothorax
- Pneumonia
- Pleural effusion



Any signs of heart failure?

- Crackles x x x x
- Gallop
- Elevated JVP
- Oedema

Any signs of infection?

- Fever $>37^{\circ}\text{C}$
- Cough \rightarrow Sputum
- Crackles x x x x
- Bronchial breathing

Breathlessness

+Chest pain

- Myocardial ischaemia + pulmonary oedema
- Pulmonary embolus
- Pneumothorax
- Pleurisy (infection)

+Crackles

- Pulmonary oedema
- Infection
- Fibrosis

+Haemoptysis

- Pulmonary embolus
- Pneumonia
- Pulmonary haemorrhage

+Wheeze

- Asthma
- COPD
- Pulmonary oedema

+Cough

- Pneumonia
- Pulmonary oedema
- Asthma/COPD

+No abnormal cardiorespiratory signs

- Pulmonary embolus
- Anaemia
- Metabolic acidosis
- Anaphylaxis
- Septicaemia

MRC Dyspnoea Scale

- 1 Breathless only with strenuous exercise.
- 2 Short of breath when hurrying on the level or up a slight hill.
- 3 Slower than most people of the same age on a level surface or have to stop for breath when walking at my own pace on the level.
- 4 Stop for breath walking 100 meters or after a walking few minutes at my own pace on the level.
- 5 Too breathless to leave the house, or breathless when dressing or undressing.

Initial Approach to Respiratory Disease

- Typical Symptoms
 - Dyspnea
 - Cough +/- sputum
 - Activity intolerance
 - Fatigue
 - Chest pain
 - Wheezing
 - Note: pattern of sx
- History
 - Temporal aspects
 - acute or chronic
 - Assoc systemic sx
 - Response to therapies
 - Family history
 - IPF, CTD
- Exposures
 - Sick contacts
 - Tobacco
 - Occupational
 - Hobbies
 - Pets
 - Drugs
 - Radiation

Classification of Lung Diseases

- **Obstructive Disease:** asthma; chronic bronchitis; emphysema; CF;
- **Restriction--Intra-parenchymal disease** (lung tissue is abnormal, e.g. HP, pulmonary fibrosis)
- **Restriction--Extra-parenchymal disease** (lung tissue is normal); chest wall deformities, kyphosis, scoliosis, obesity, pleural effusions, ascites
 - Neuromuscular disorders (“bellows”)

Is this really necessary?
I'm empty....why are you
yelling at me?

**BLOW! BLOW!
BLOW! BLOW!
ETC., ETC.....**



Case #1



- 24 yo F with hx of asthma presenting with shortness of breath, wheezing, dry cough for two days, worsening today; no fever or chills, no chest pain; no congestion. Tried inhaler every 2 hours at home for past 6 hours without relief.
- What do you do first?

Things you want to know



- What usually triggers your asthma?
- Prior ED visits, hospitalizations, ICU admissions?
Prior intubations?
- Current medications
 - Frequency of inhaler use
 - Recent steroids
- Baseline peak flow values
- Fevers, recent infections, and sick contacts

Why is all that so important?

- Risk factors for sudden death from asthma:
 - Past history of sudden severe exacerbations
 - Prior **intubation** for asthma
 - Prior asthma admission to an **ICU**
 - In the past year:
 - 2 or more **hospitalizations** for asthma
 - 3 or more **ED visits** for asthma
 - Hospitalization or an ED visit for asthma within the past **month**

Differential Diagnosis for SOB

Most Common

- Obstructive: Asthma, COPD
- Congestive heart failure
- Ischemic heart disease
- Pneumonia
- Psychogenic: Panic, anxiety

Urgently Life Threatening

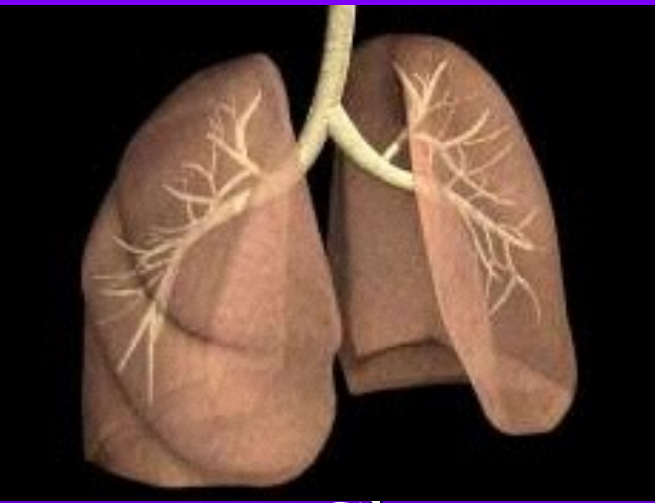
- Upper airway obstruction
 - Foreign body
 - Angioedema/anaphylaxis
- Tension pneumothorax
- Pulmonary embolism
- Neuromuscular weakness
 - Myasthenia gravis
 - Guillain-Barre

Focused Physical Exam



- Vital signs
 - RR, HR, BP, temp, O2 Sat
- Mental Status
 - Alert, confused, lethargic
- Heart
 - JVD, muffled heart sounds, S3, S4
- Lungs
 - Rales, wheezing, diminished or absent BS, stridor
 - Respiratory accessory muscle use
- Abdomen
 - Hepatomegaly, ascites
- Skin
 - Diaphoresis, cyanosis
- Extremities
 - Edema
 - Unilateral leg swelling
- Neurologic
 - Focal neurologic deficits

****Reassess respiratory status frequently especially in the first 15 minutes or so**



COPD

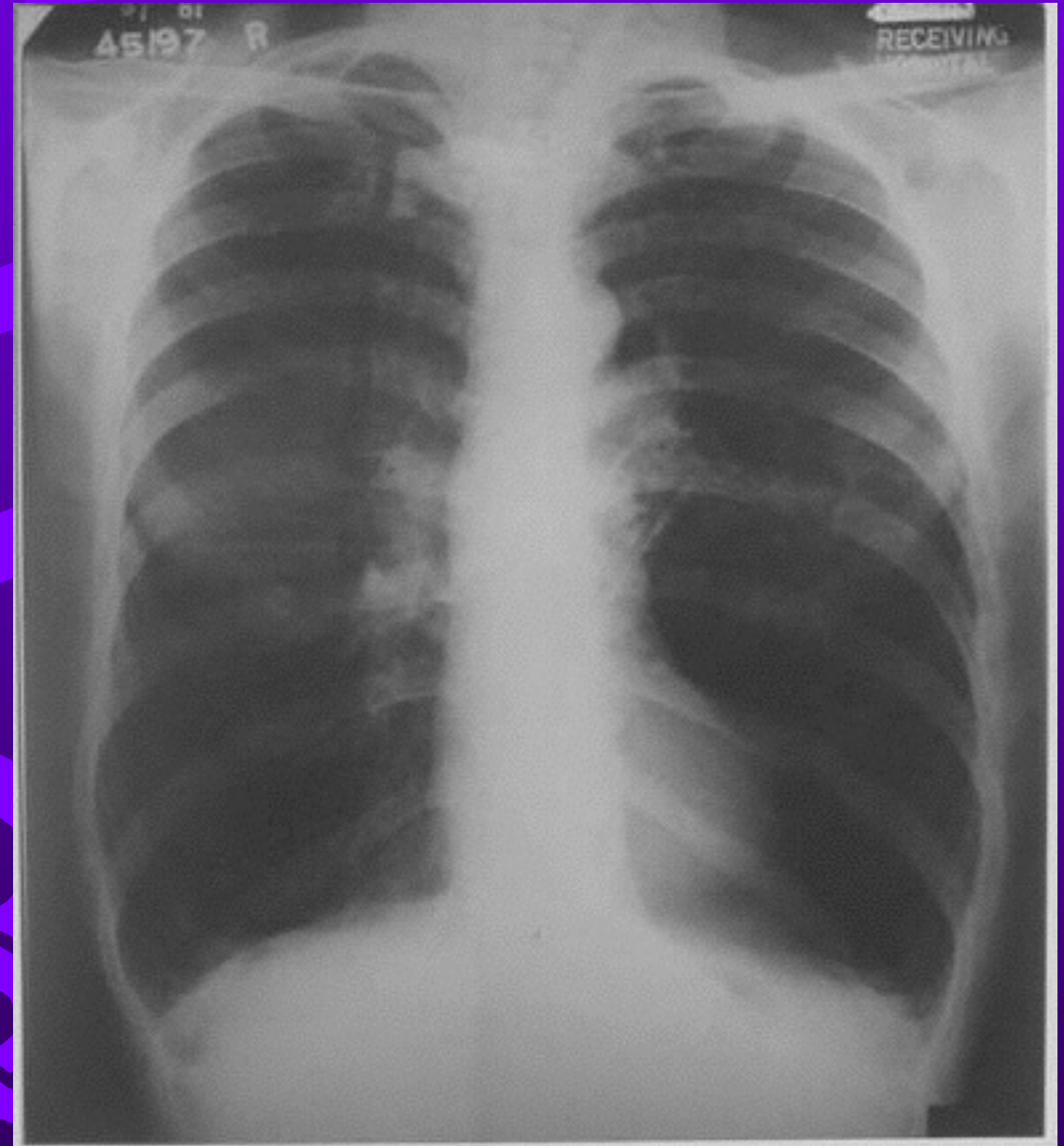
- Chronic airway inflammation
 - Inflammatory cells and mediators
 - Protease / anti-protease imbalance
 - Oxidative stress
- Increases in lung compliance
- Becomes an obstructive process
- **Ask patients about:**
 - History of COPD
 - Change in cough or sputum
 - Fever, infectious signs
 - Medications (steroids)
 - Environmental exposures
 - Smoking history

Physical exam findings in COPD

- Signs of Hypoxemia
 - Tachypnea
 - Tachycardia
 - Hypertension
 - Cyanosis
- Signs of Hypercapnia
 - Altered mental status
 - Hypopnea

COPD

- Chest X-ray
 - Hyperinflation
 - Flattened diaphragms
 - Increased AP diameter
- EKG
 - Wandering pacemaker
 - Multifocal atrial tachycardia (MAT)
 - Right axis deviation



Case #3



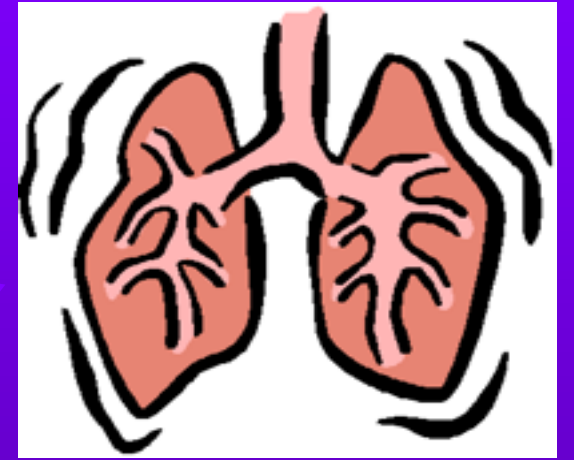
- 35 yo previously healthy F c/o one week of headache, sore throat and muscle aches, fevers, now with productive cough and increasing fatigue.
- On physical exam she is febrile and has decreased breath sounds over the RLL.
- What is your differential and work-up?

Pneumonia



- **Clinical features:**
- Typically: Cough, dyspnea, sputum production, fever, pleuritic chest pain
- Pneumococcal: sudden onset of fever, rigors, productive cough, tachypnea
- Atypical pneumonia: Coryza, low grade fevers, non-productive cough
- **On exam:**
- Tachypnea, tachycardia, fever
- Inspiratory rales = Alveolar fluid
- Bronchial breath sounds = Consolidation
- Dullness/decreased BS = Pleural effusion
- Rhonchi = Bronchial congestion

Pathophysiology



- Usually inhaled/aspirated pathogens
 - Risk- Stroke, seizure, intoxication
- Hematogenous spread- Staph. aureus
- Infection within alveoli with intense inflammatory response
 - Filling alveoli with bacteria, WBC, exudate

Which patient groups get which types?

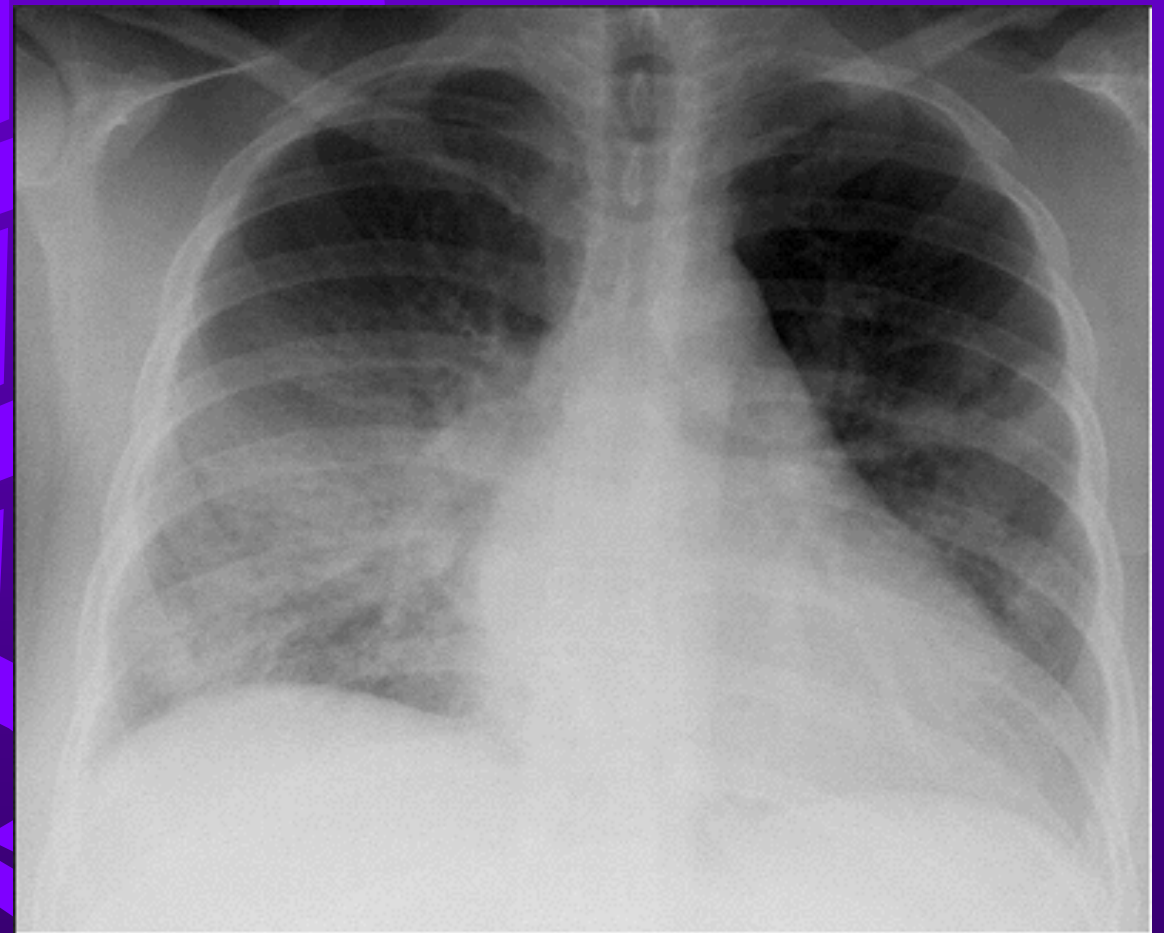
- Pneumococcus
- Staph aureus
- Klebsiella
- Pseudomonas
- Haemophilus
- Atypical
 - Chlamydia
 - Mycoplasma
 - Legionella

Special populations

- Diabetics
- HIV
 - Pneumonia more common and has higher morbidity than non-HIV population
 - Pneumococcus= Most common bacteria
 - CD4>800: Bacterial more common
 - CD4 250-500: TB, cryptococcus, histoplasma
 - CD4< 200: PCP, CMV
- Elderly/Nursing home
 - Predictors for morbidity: Tachycardia, tachypnea, temp>100.4, somnolence, confusion, crackles, leukocytosis
 - Pathogens: Pneumococcus, gram negatives, Haemophilus, influenza
 - May just present with confusion, weakness

Pneumonia

- Chest X-ray
- Measure O₂ sat, CBC, electrolytes
- Blood cultures for admitted patients (before antibiotics)



Congestive Heart Failure

- Can present with acute pulmonary edema and with respiratory distress
- Due to decreasing CO and rising SVR 🗨
- Sympathetic nervous system and renin-angiotensin-aldosterone system are activated
- Result: Volume overload, pulmonary edema, resp distress



Causes of acute decompensation in CHF

- Non-compliance
 - Medications: diuretics
 - Diet: excessive salt
- Cardiac
 - Arrhythmia
 - ACS
 - Uncontrolled HTN
- Other
 - Volume overload due to renal failure
 - PE
 - Exacerbation of other co-morbidity (ex. COPD)

Signs & Symptoms of CHF


- Symptoms

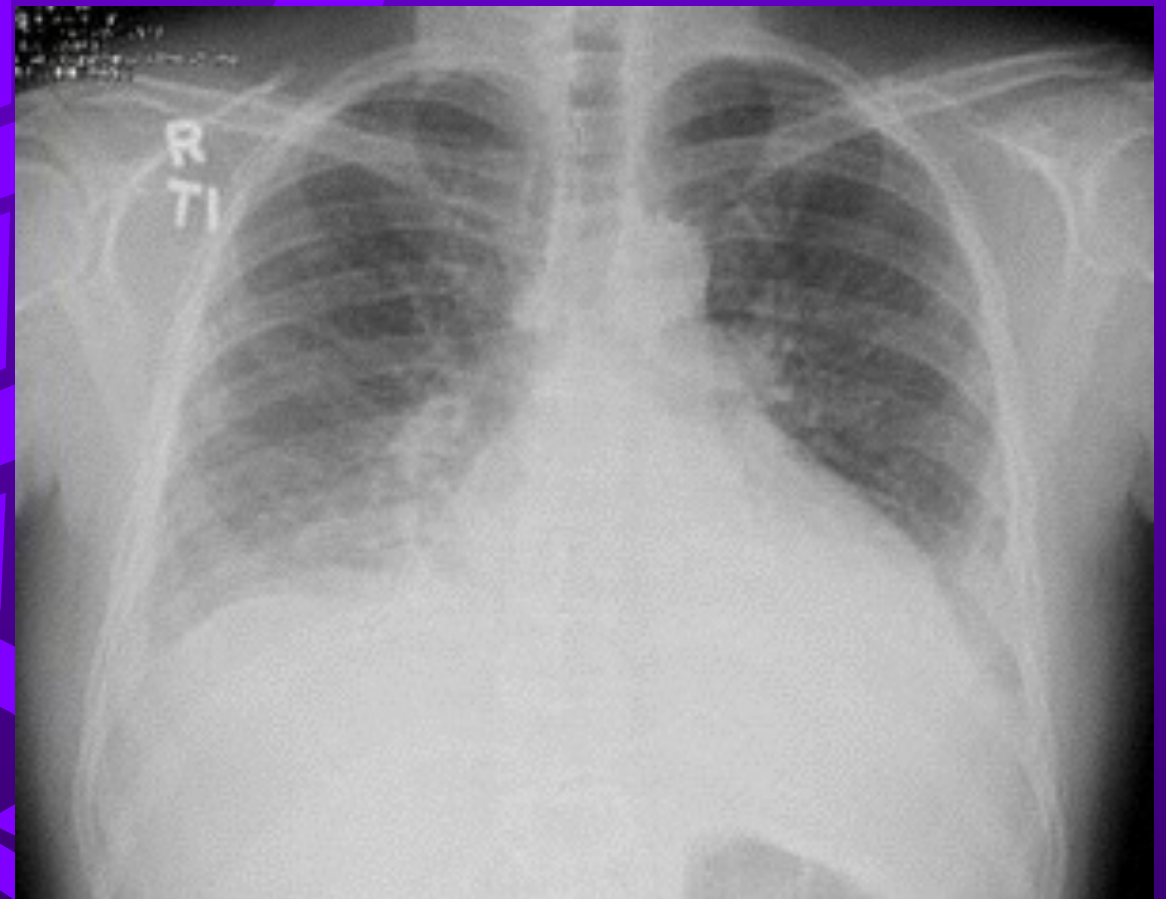
- Respiratory distress
- Cool / diaphoretic skin
- Weight gain
- Peripheral edema
- Orthopnea
- Paroxysmal nocturnal dyspnea
- Abdominal pain

- Signs

- Elevated JVD
- S3
- Hypertension
- Rales
- +/- peripheral edema
- +/- RUQ tenderness (congested liver)
- Tachypnea

Evaluation of CHF

-  CXR (portable)
 - Cardiomegaly
 - Vascular congestion
 - Pulmonary edema
- Labs
 - CBC, electrolytes, cardiac enzymes, BNP
- EKG
- Search for cause of decompensation

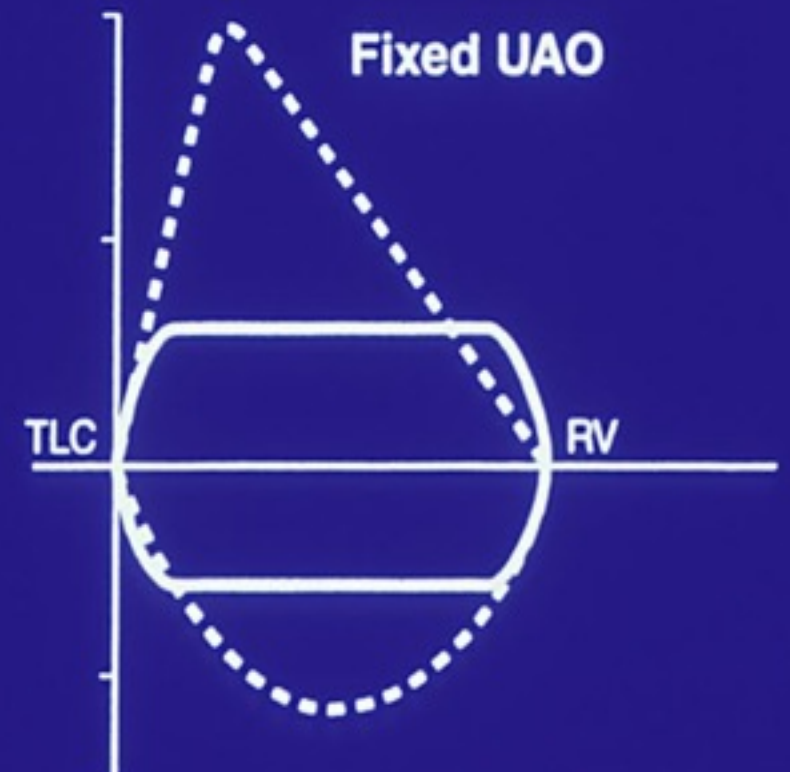
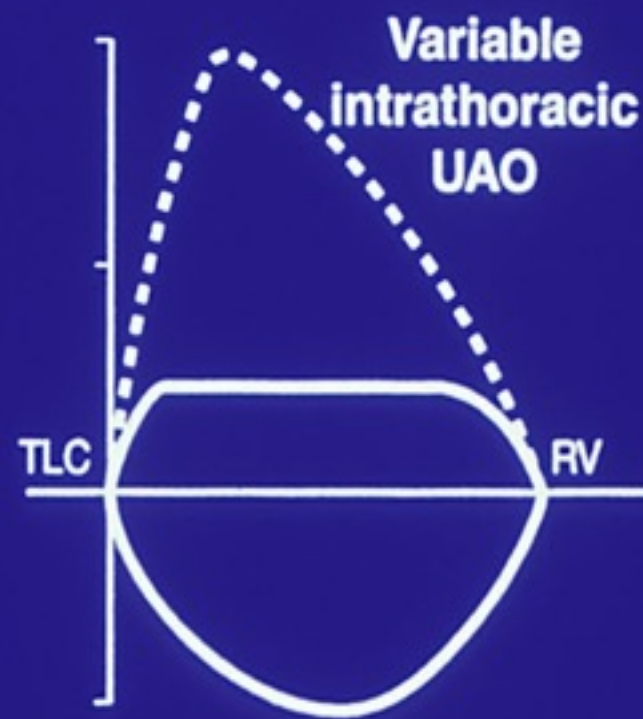
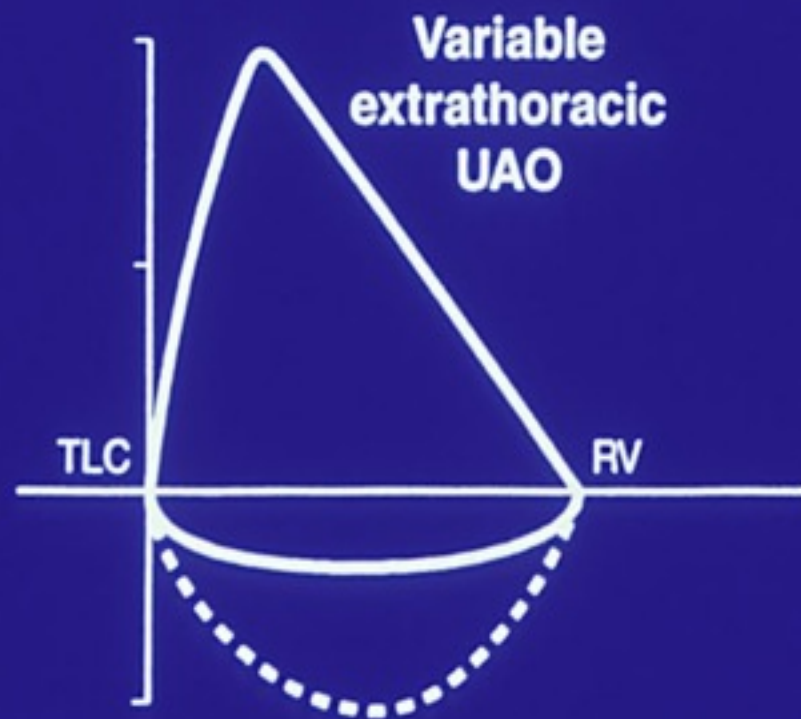
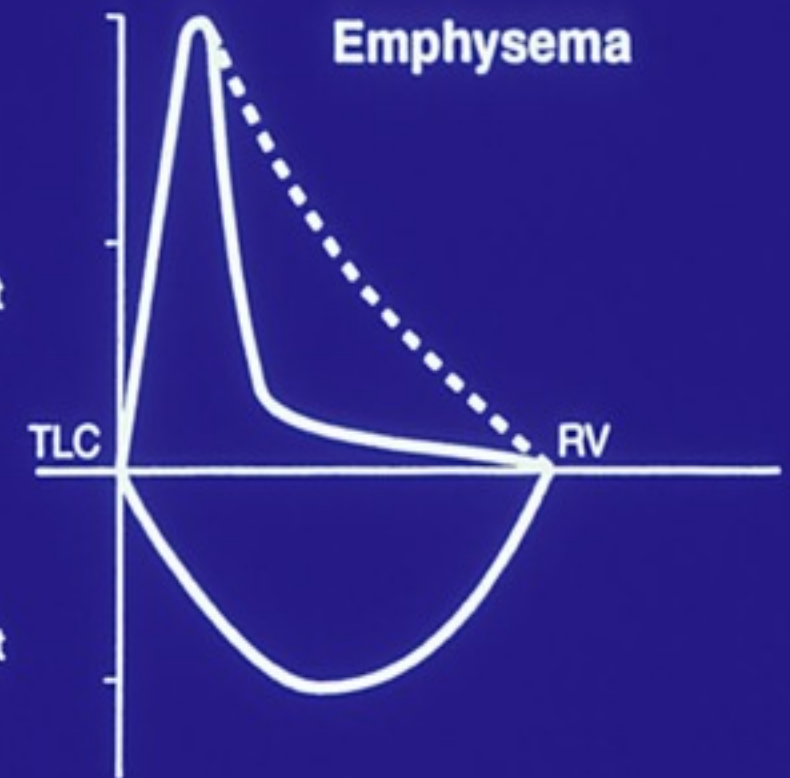
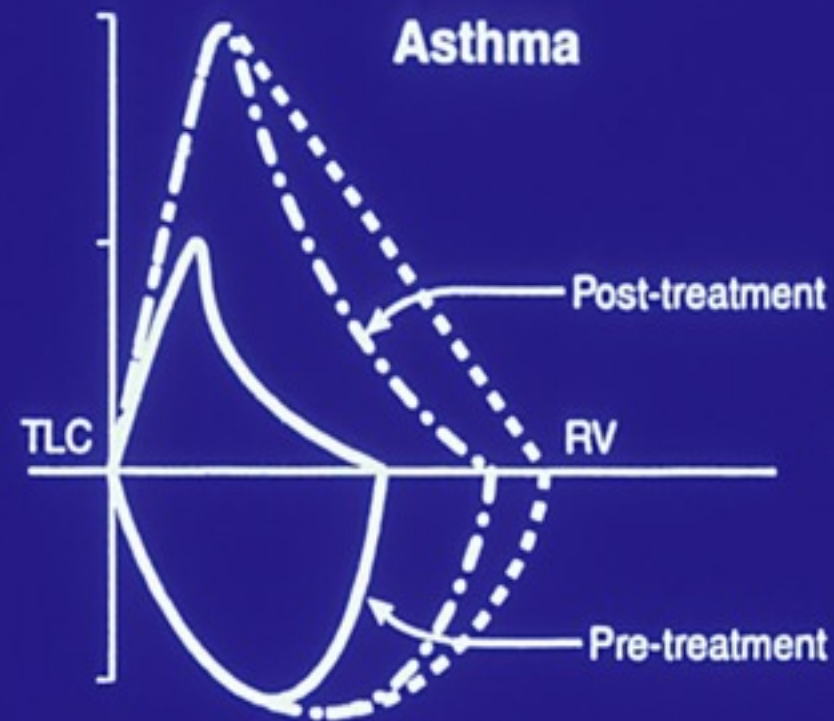
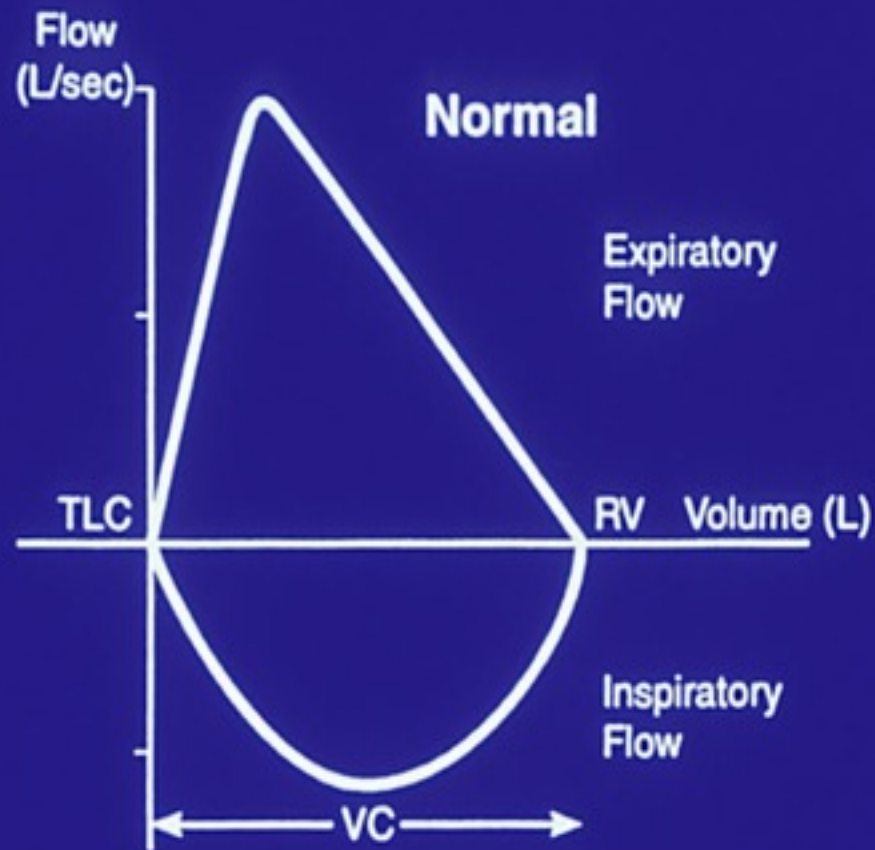


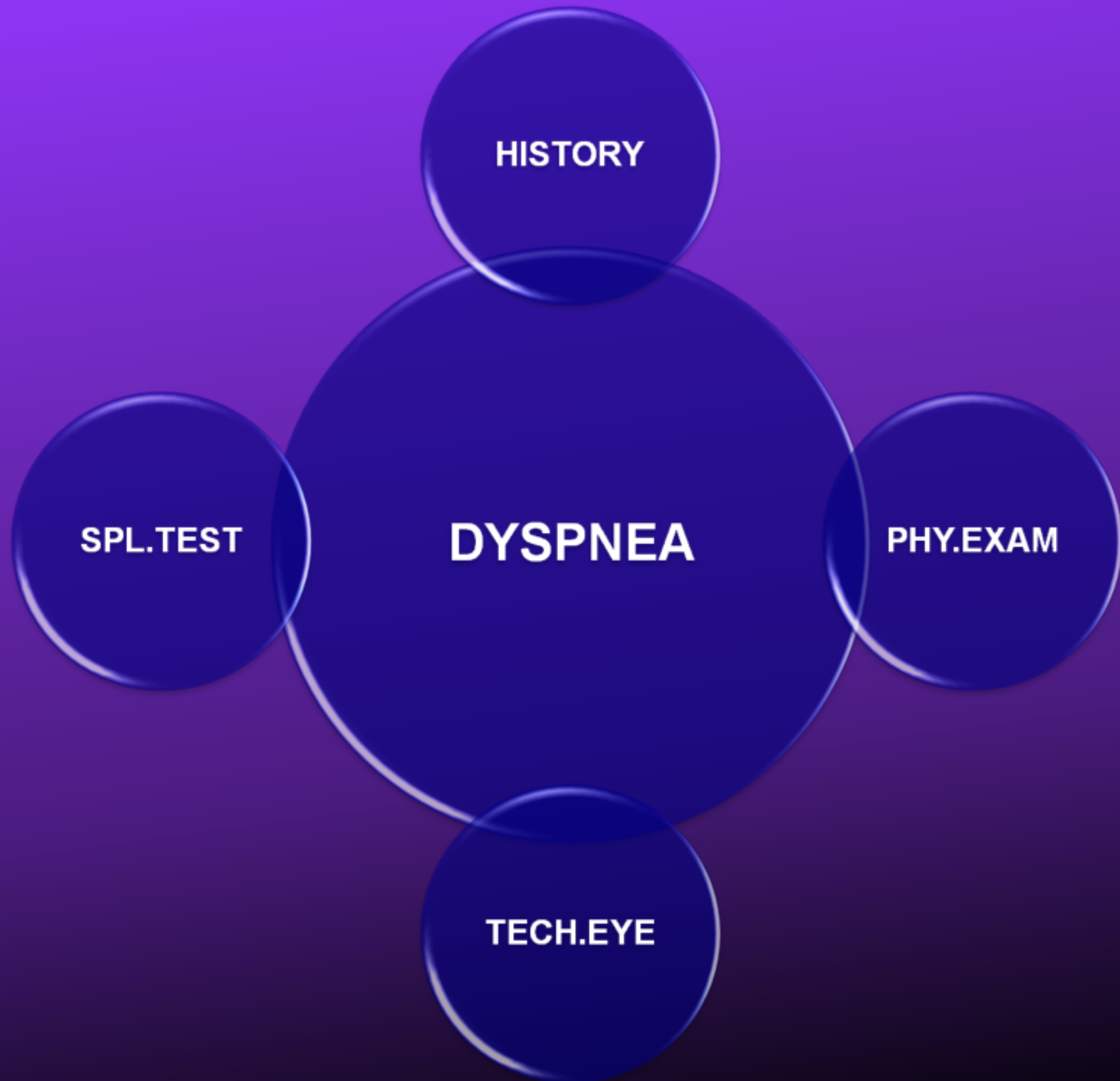
Differential Diagnosis

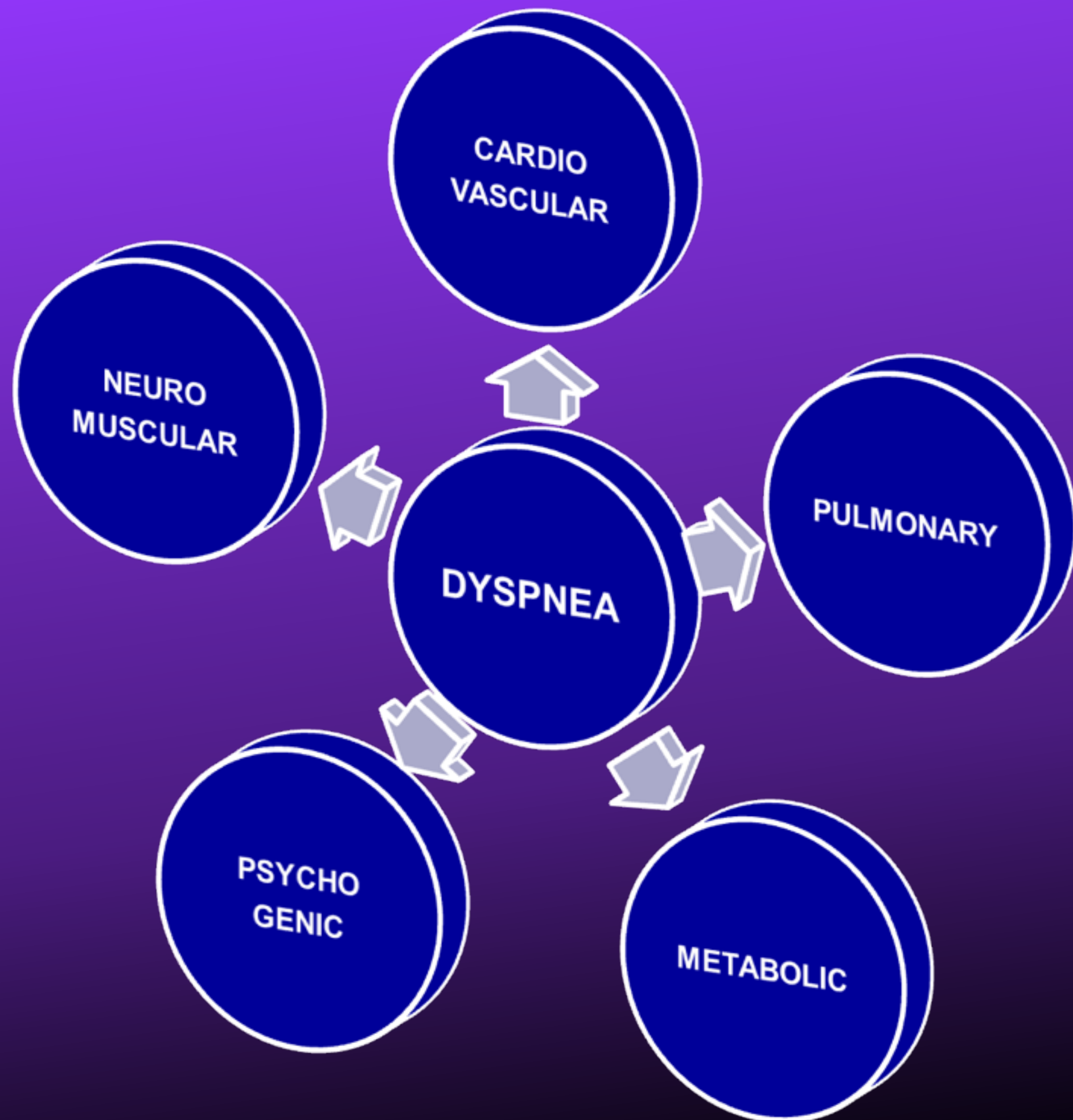


- Pulmonary:
 - Asthma/COPD exacerbation
 - Pulmonary embolus
 - Pneumothorax
 - Pleural effusion
 - Pneumonia
- Cardiac:
 - ACS, arrhythmia
 - Acute valvular insufficiency
 - Pericardial tamponade
- Fluid retentive states:
 - Liver failure, portal vein thrombosis
 - Renal failure
 - Nephrotic syndrome
 - Hypoproteinemia
- High output states:
 - Sepsis
 - Anemia
 - Thyroid dysfunction

Flow-volume Loops







Breathless patient

Oxygen (15 L) via NRB mask
with 15l/Min o2

CBC, CBG, ECG, ABG, UREA, CREAT, CXR, USG THORAX

**HAEMODYNAMICALLY
UNSTABLE**

**HEMODYNAMICALLY
STABLE**

Unstable patient

AIRWAY

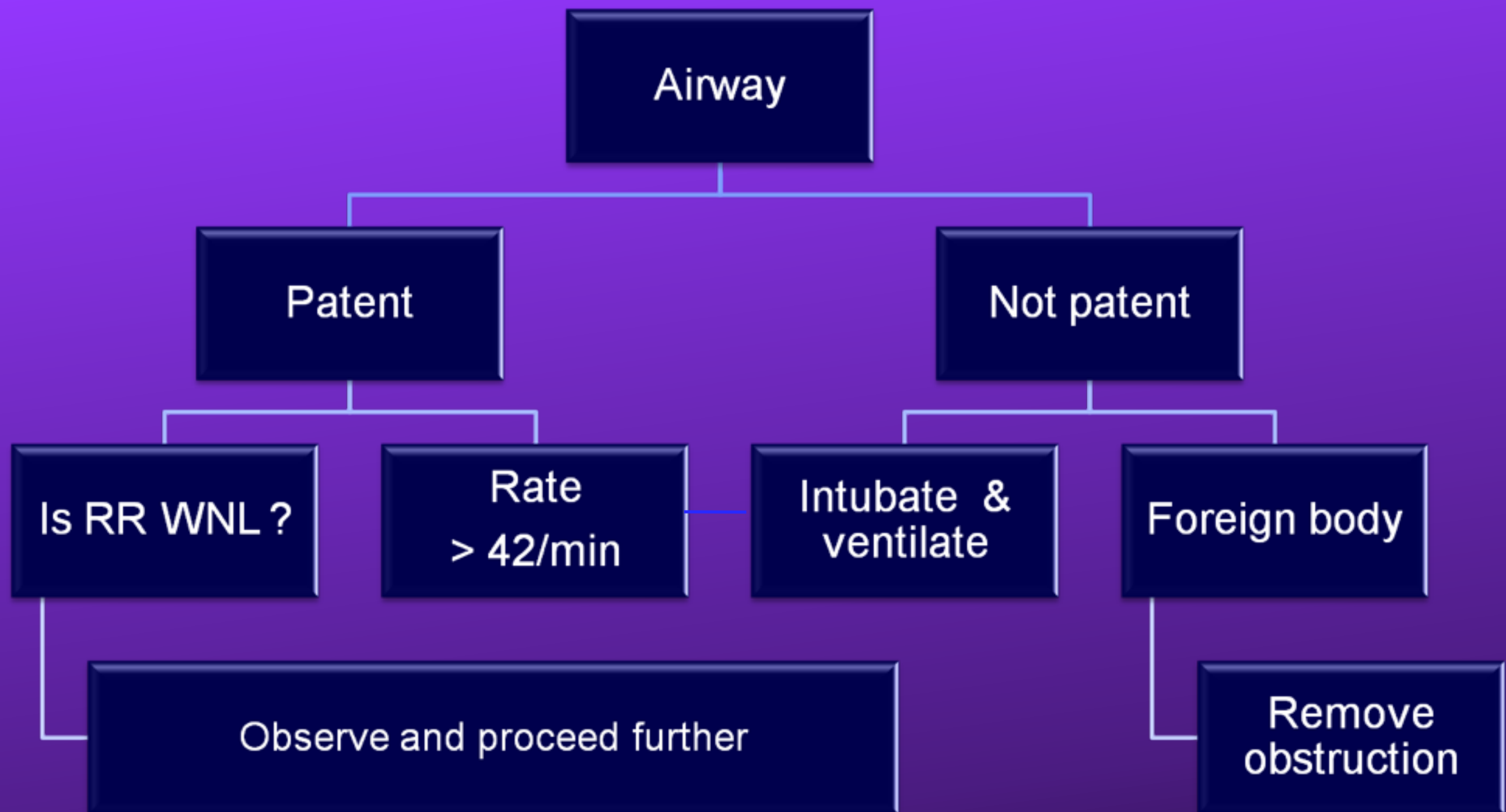


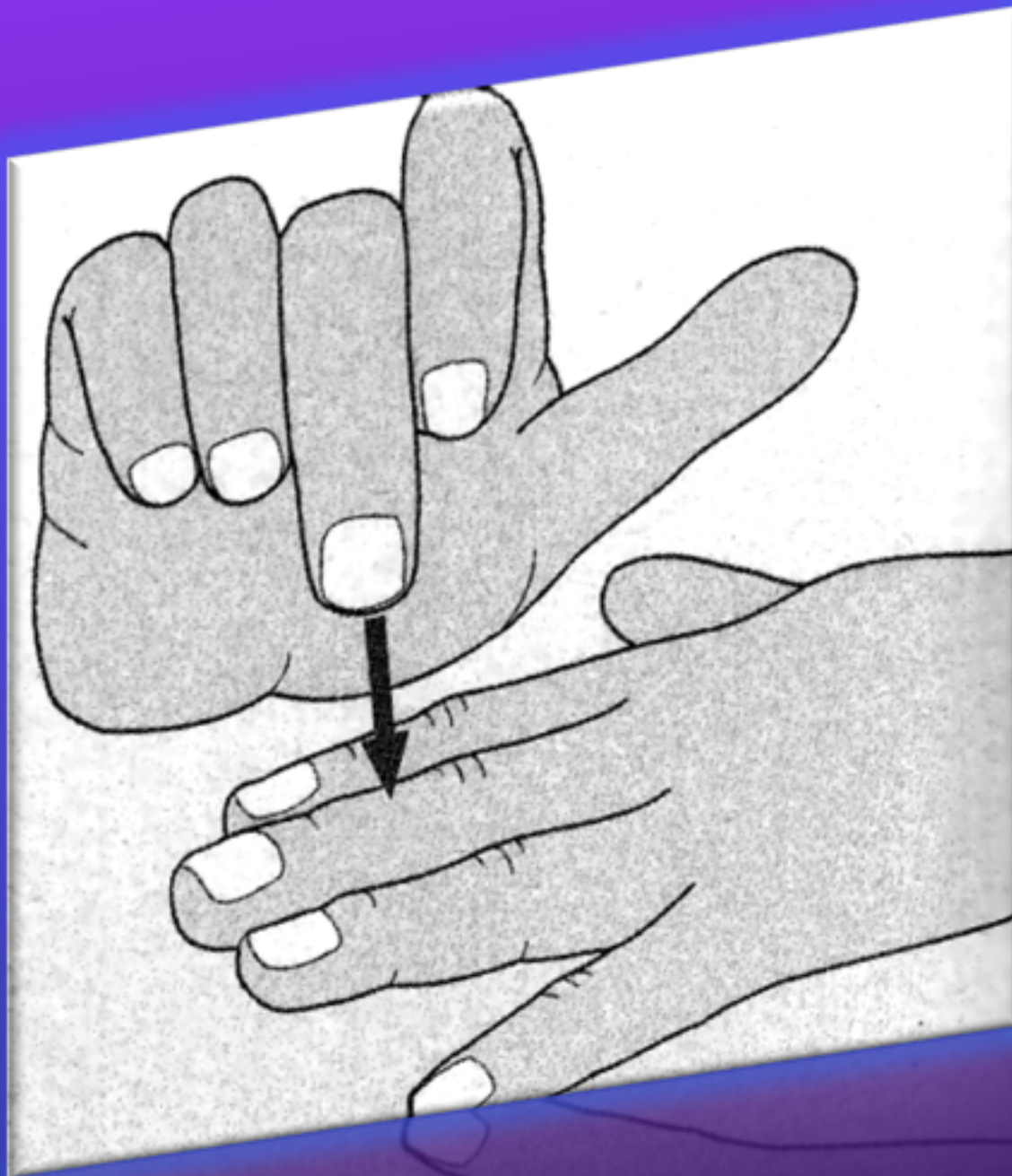
BREATHING

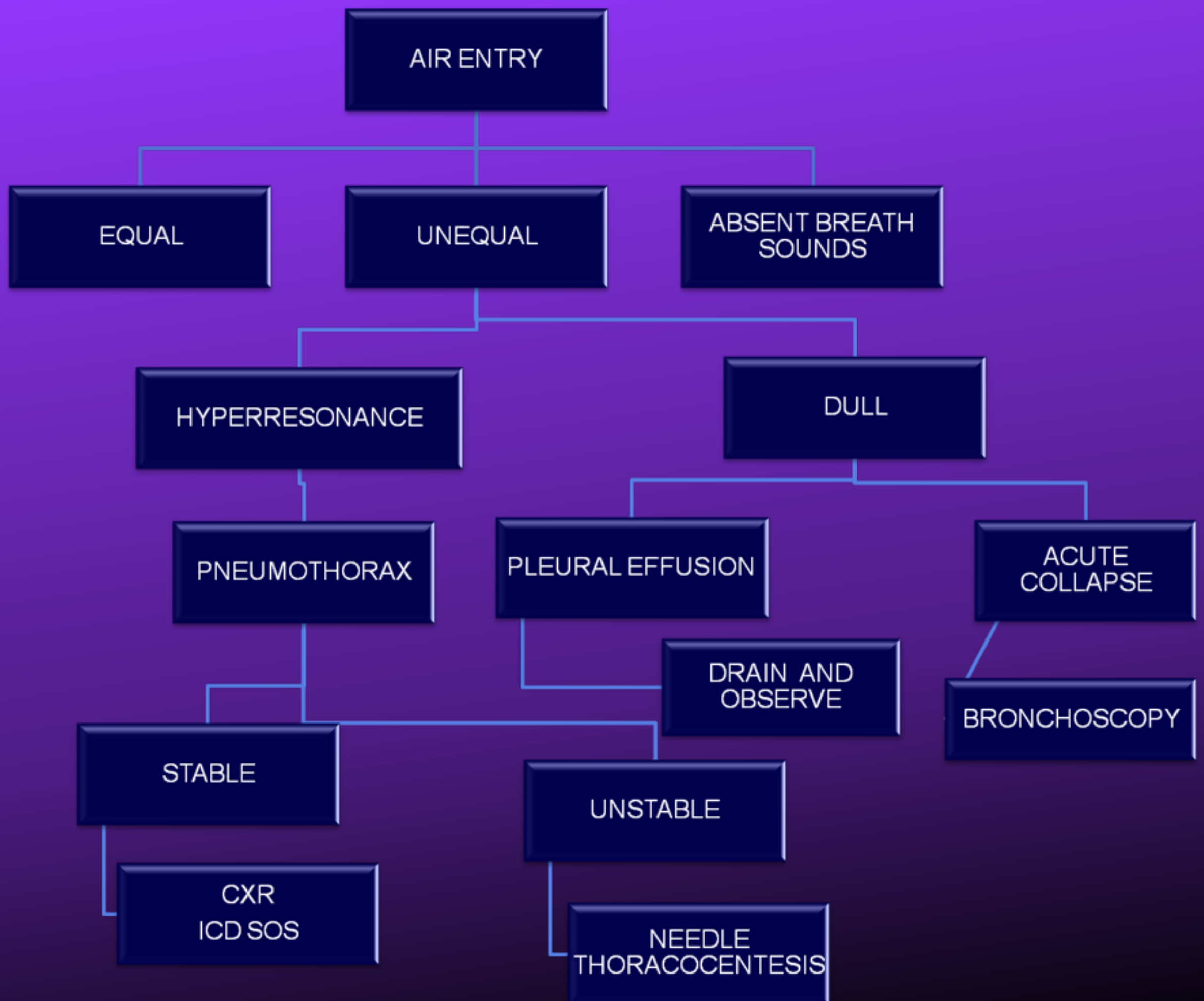


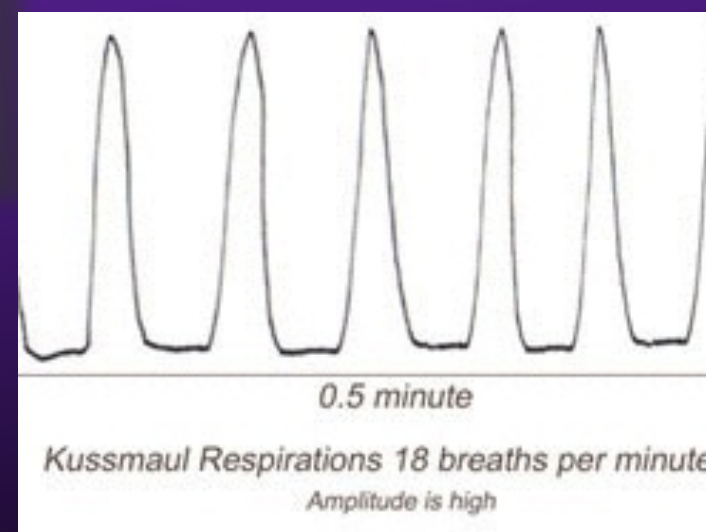
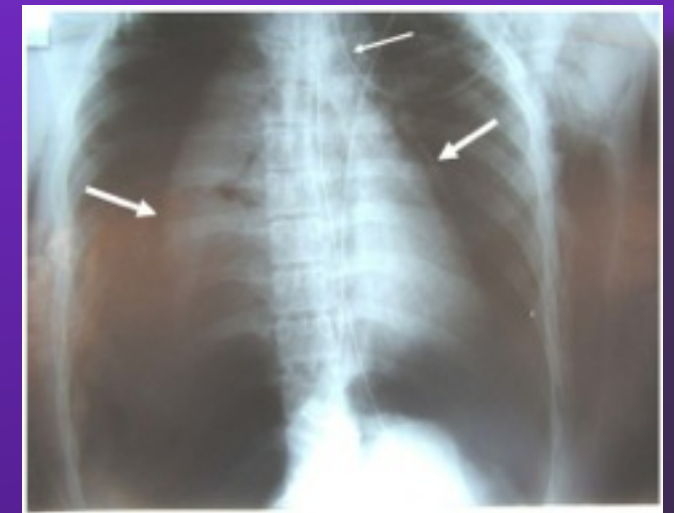
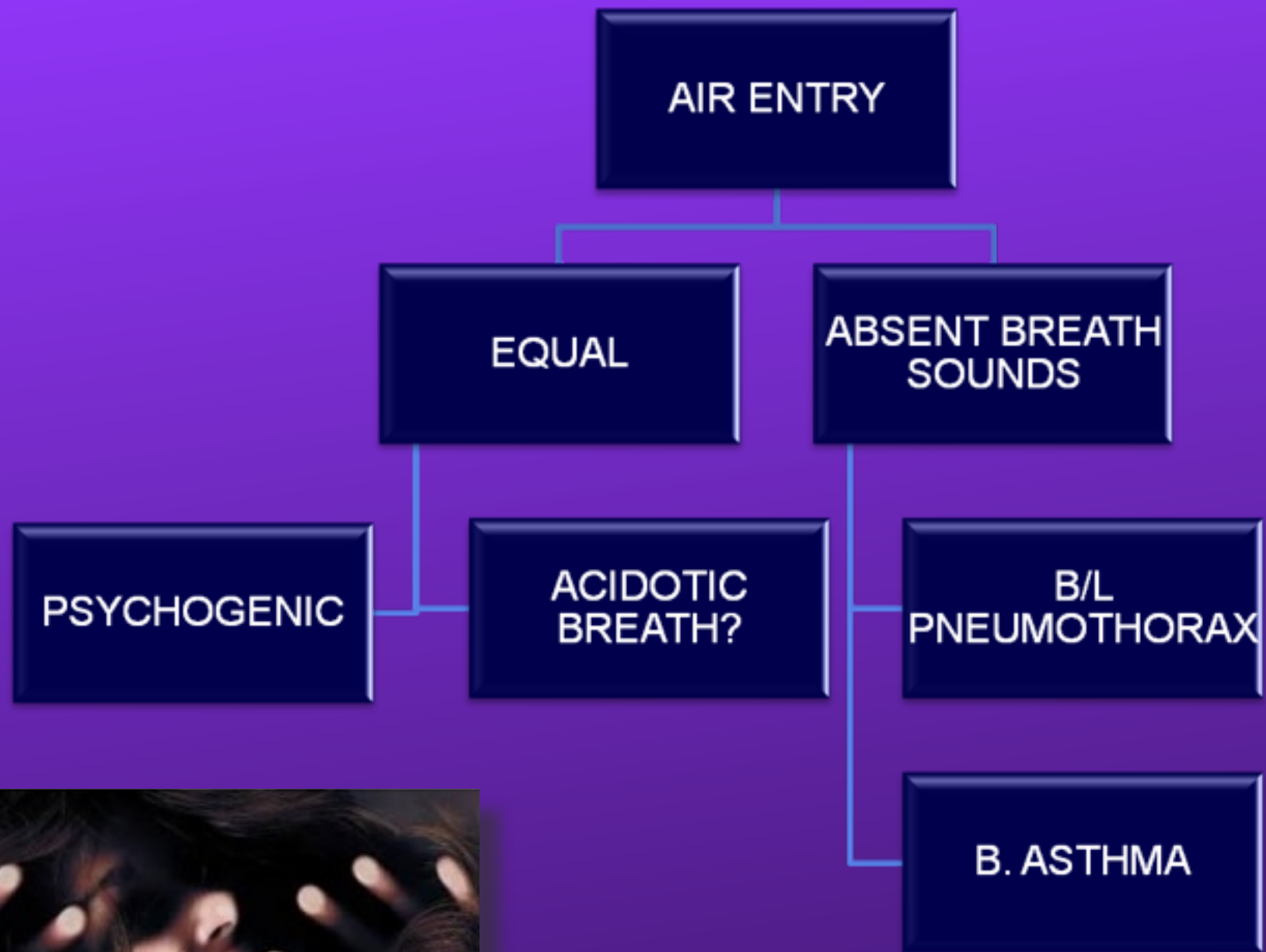
CIRCULATION

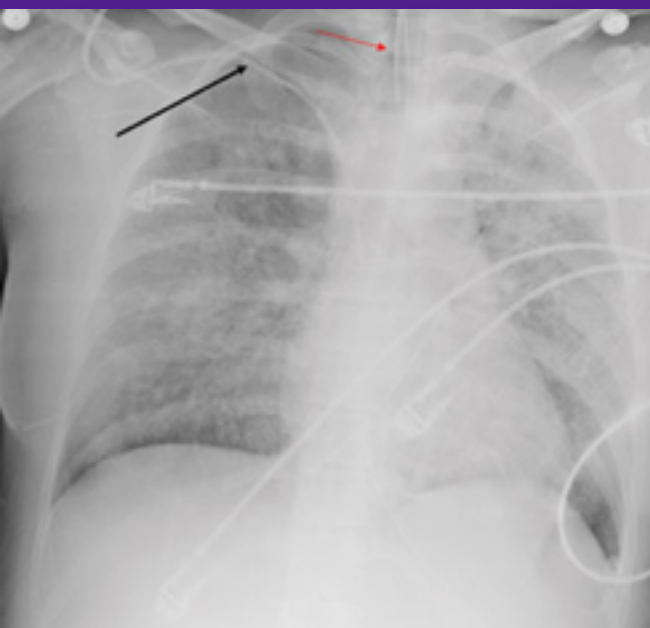
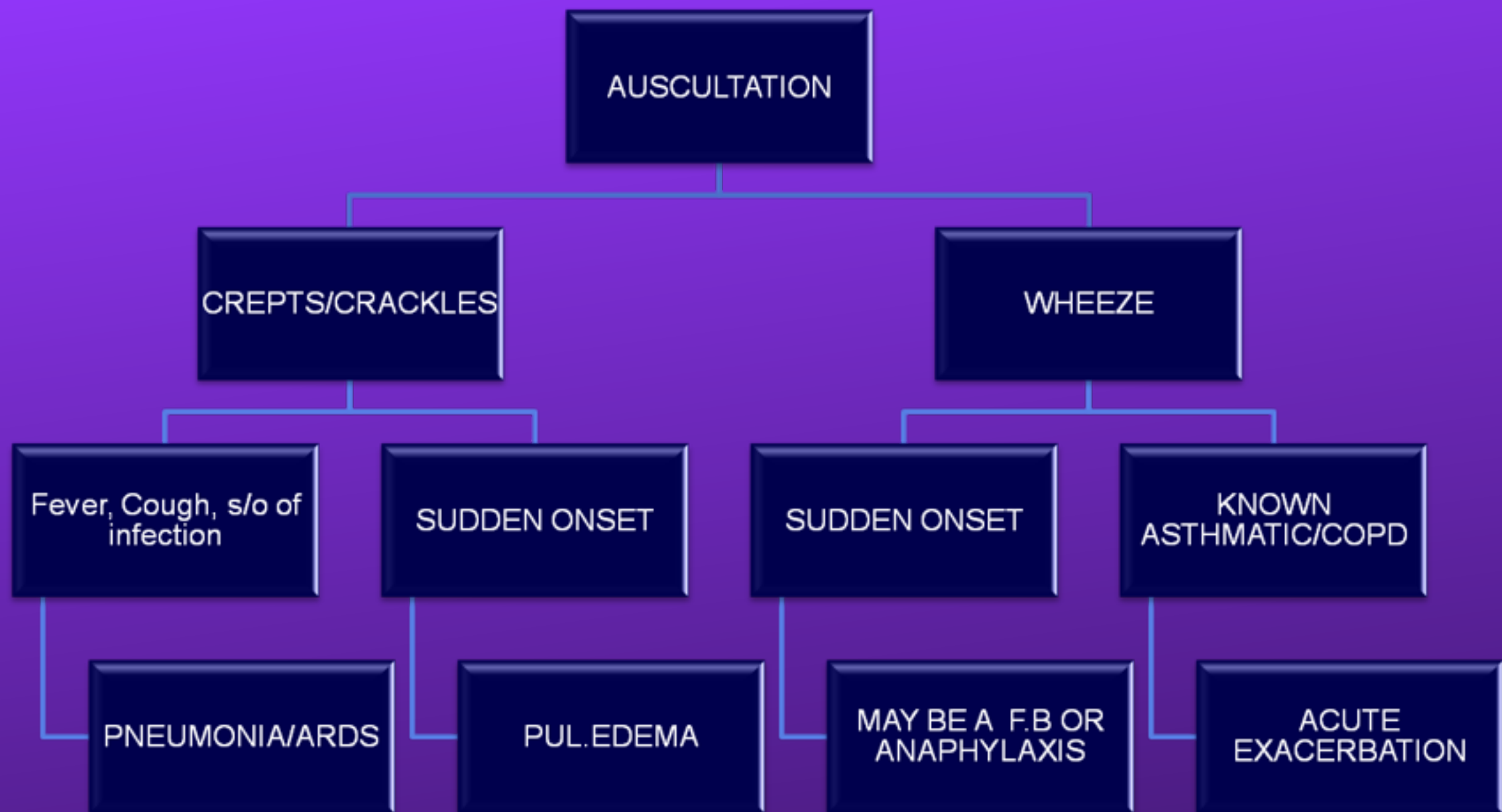


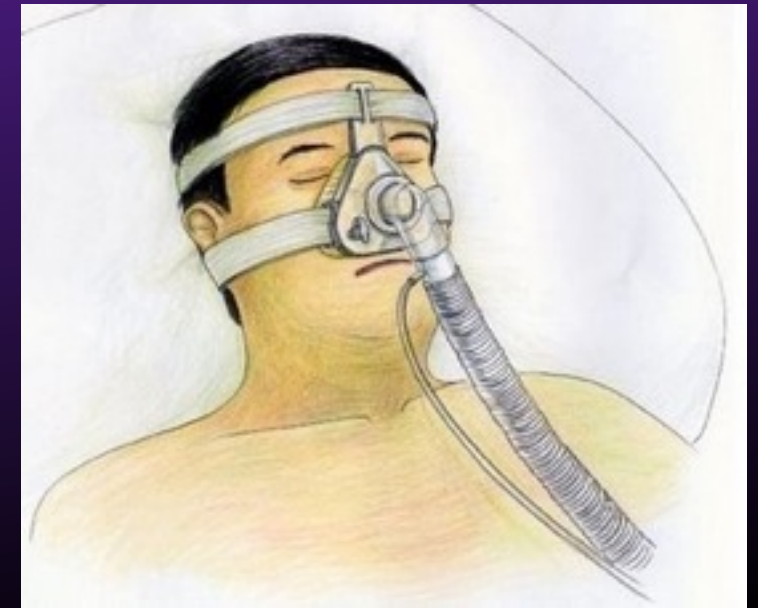
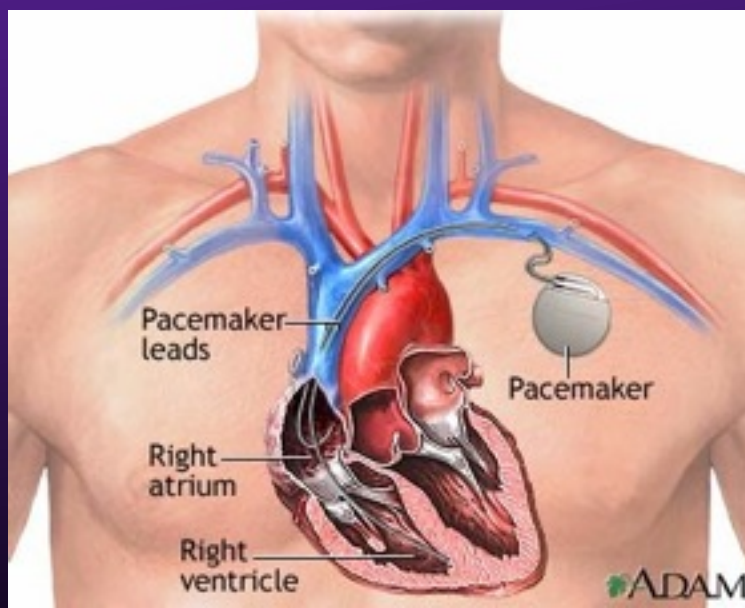
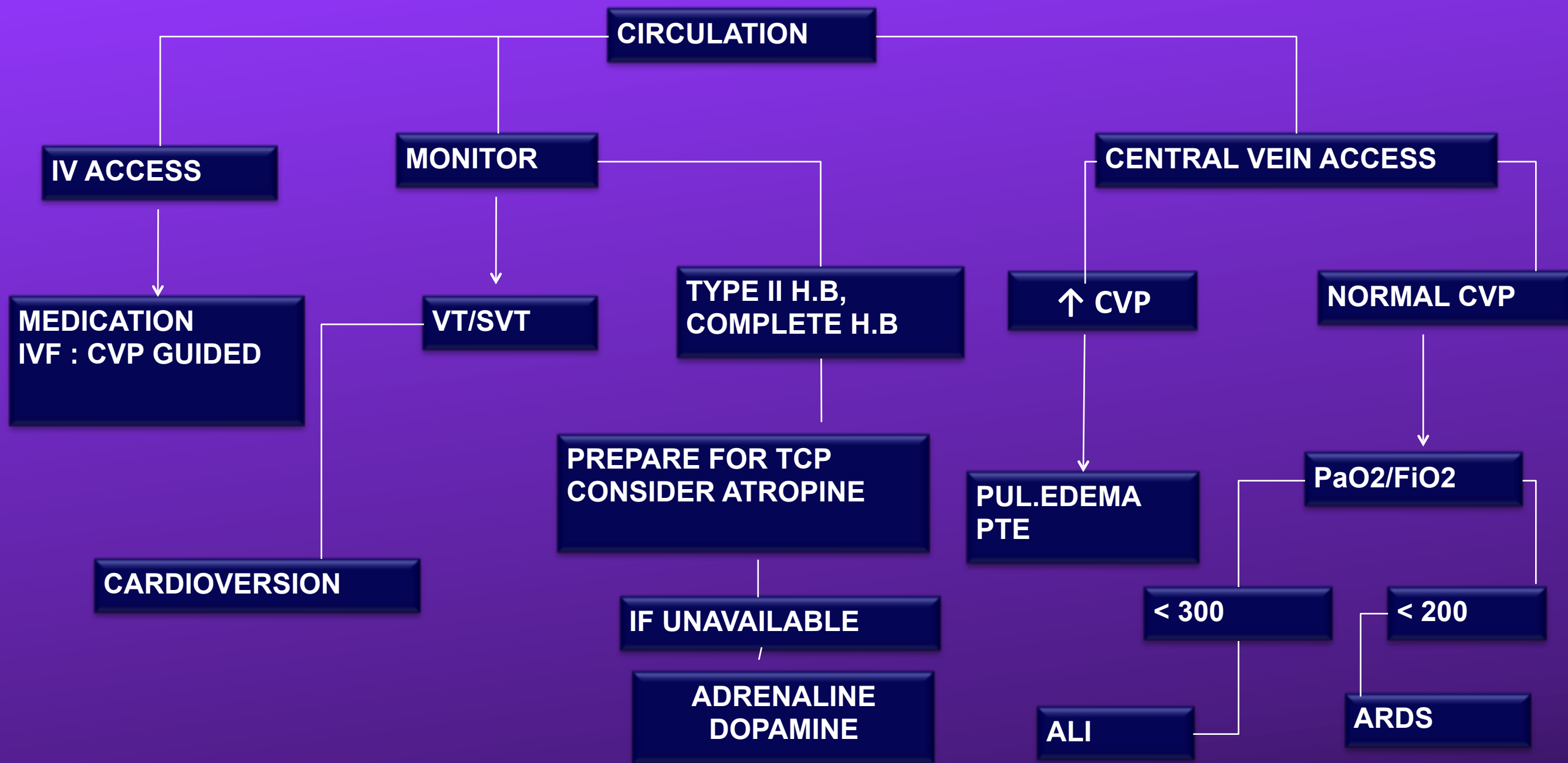












Raised CBG 🗨️

- With acidosis – DKA
- Without acidosis : HHS

**Raised Urea &
Creat / Acidosis**

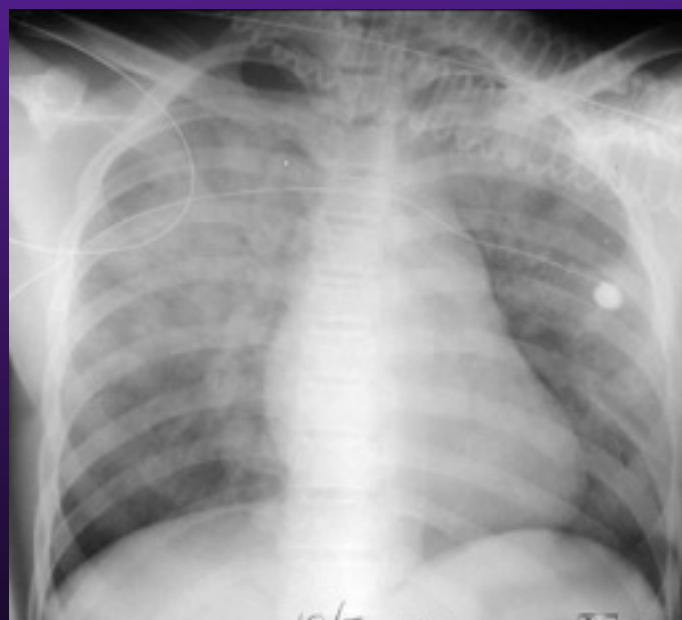
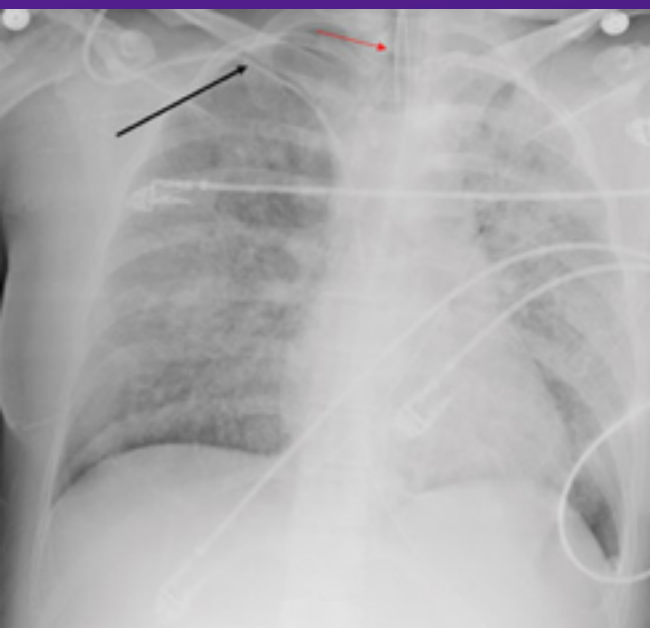
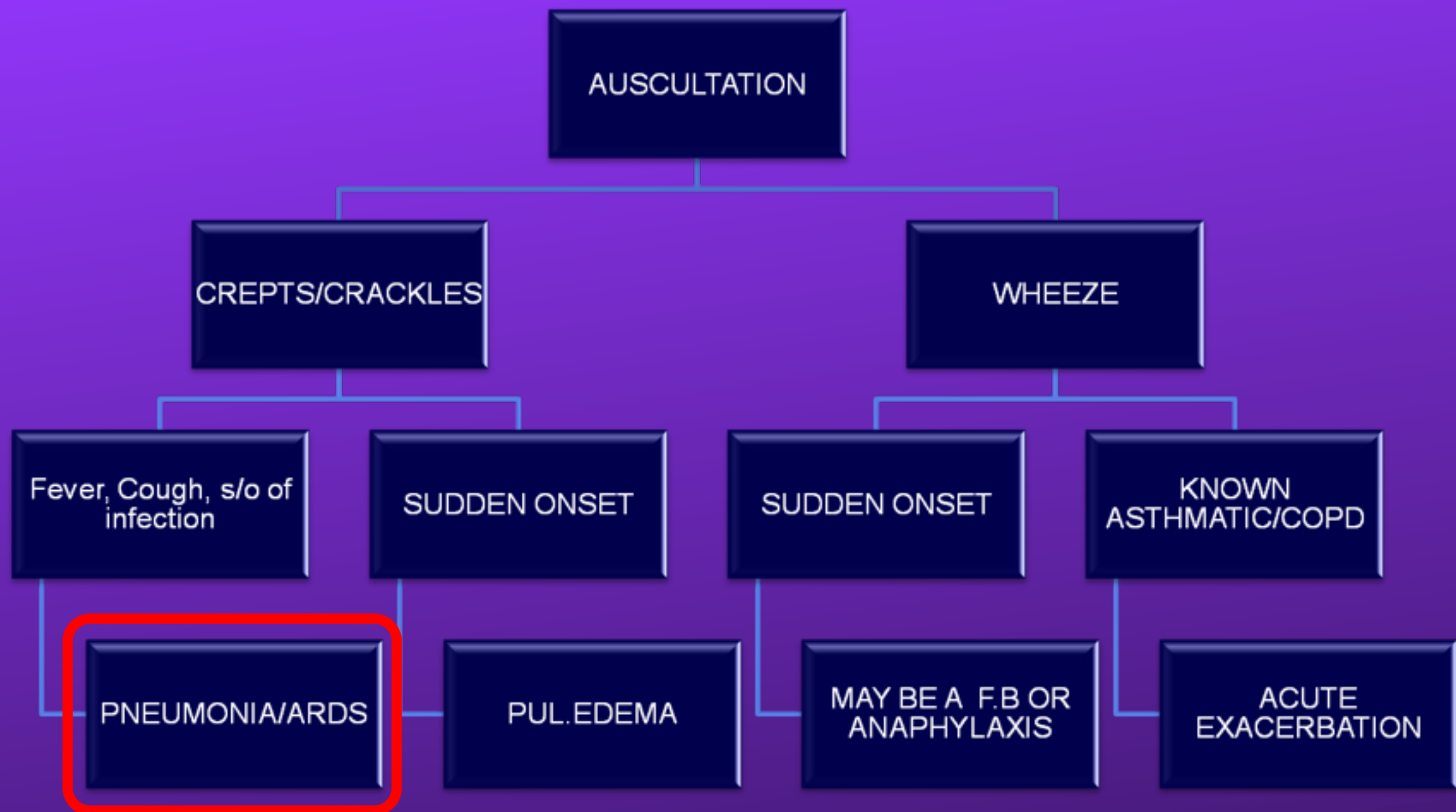
- Renal Failure : Plan for Dialysis

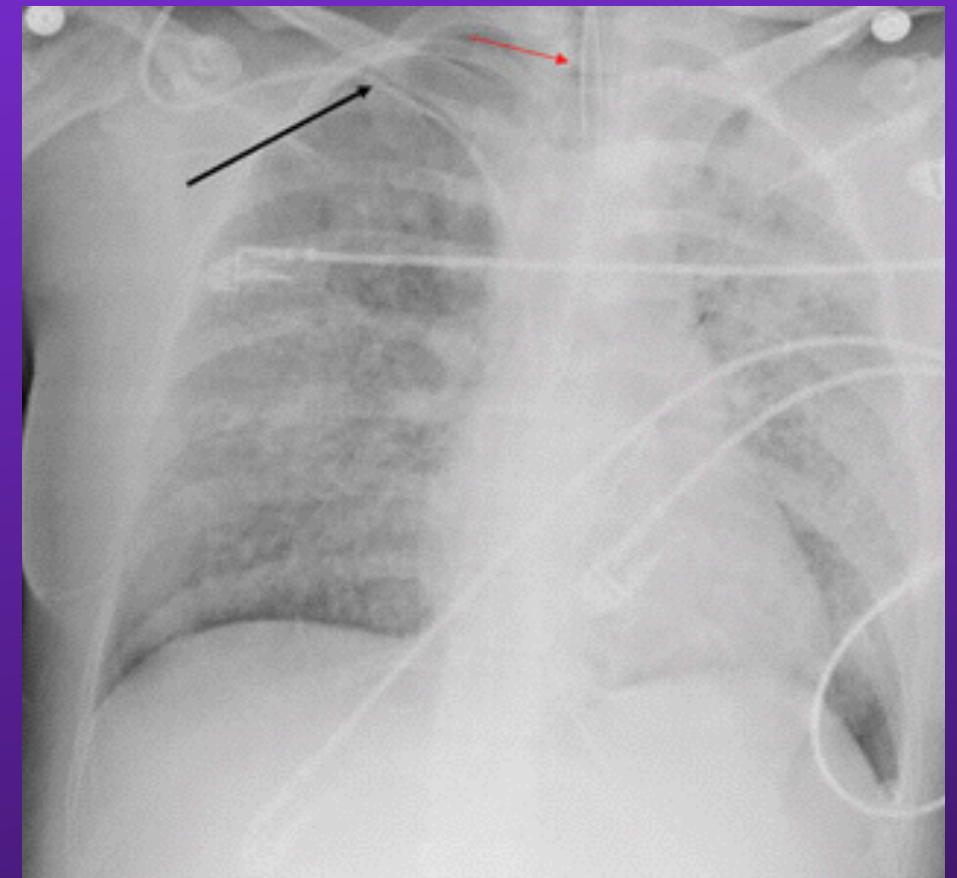
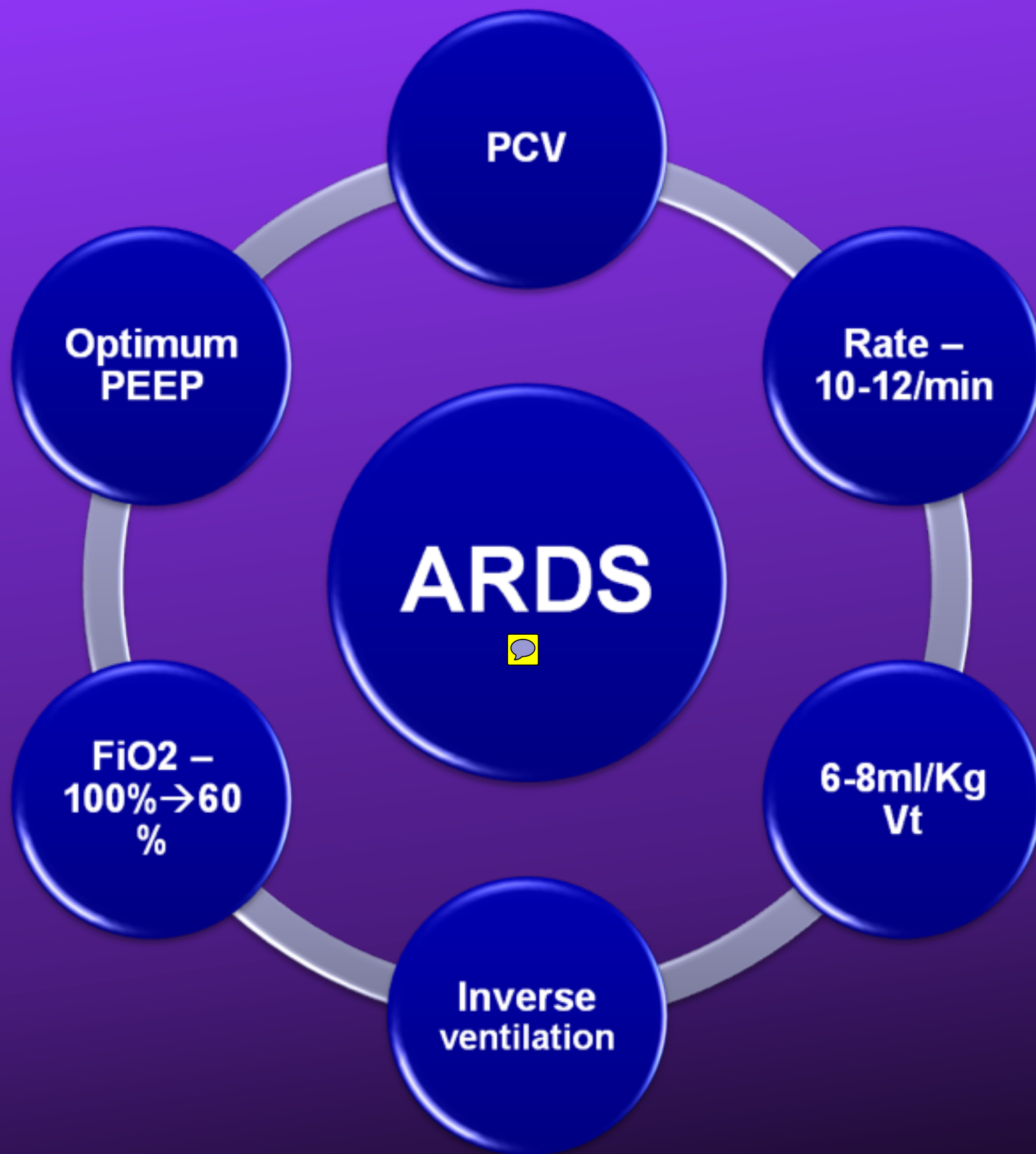
Decrease Hb

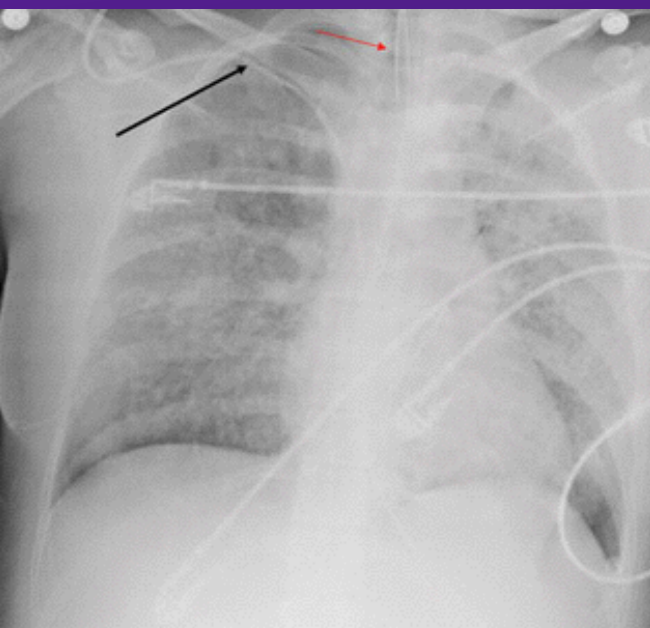
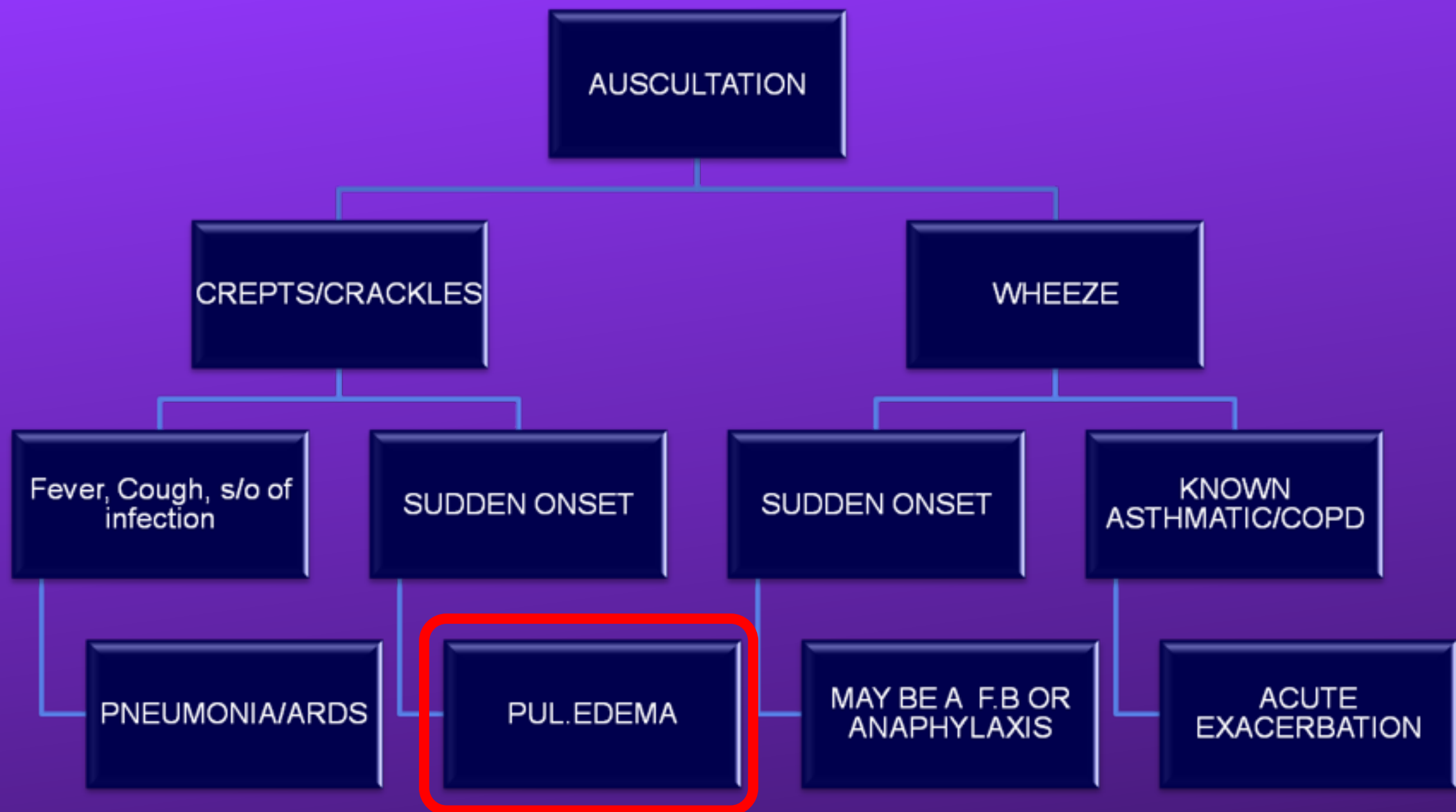
- Anaemia : Correct with transfusion

MI / Arrhythmias

- Thrombolysis/ PCI / Pacing/ Cardioversion

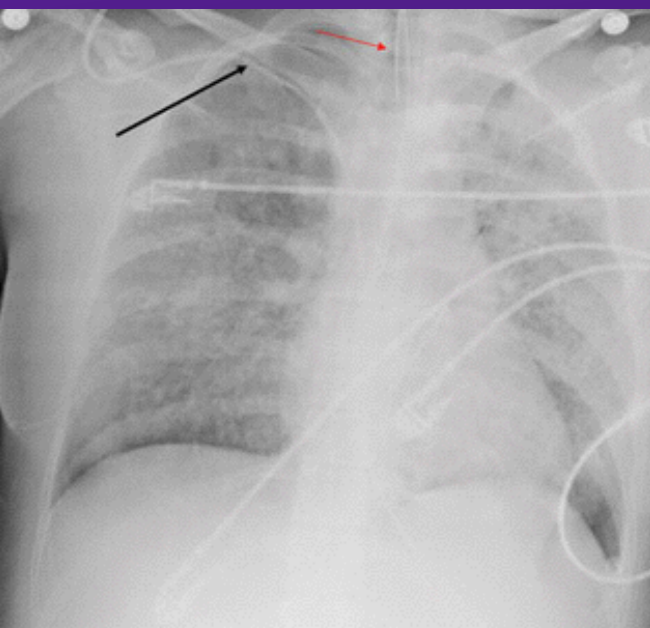
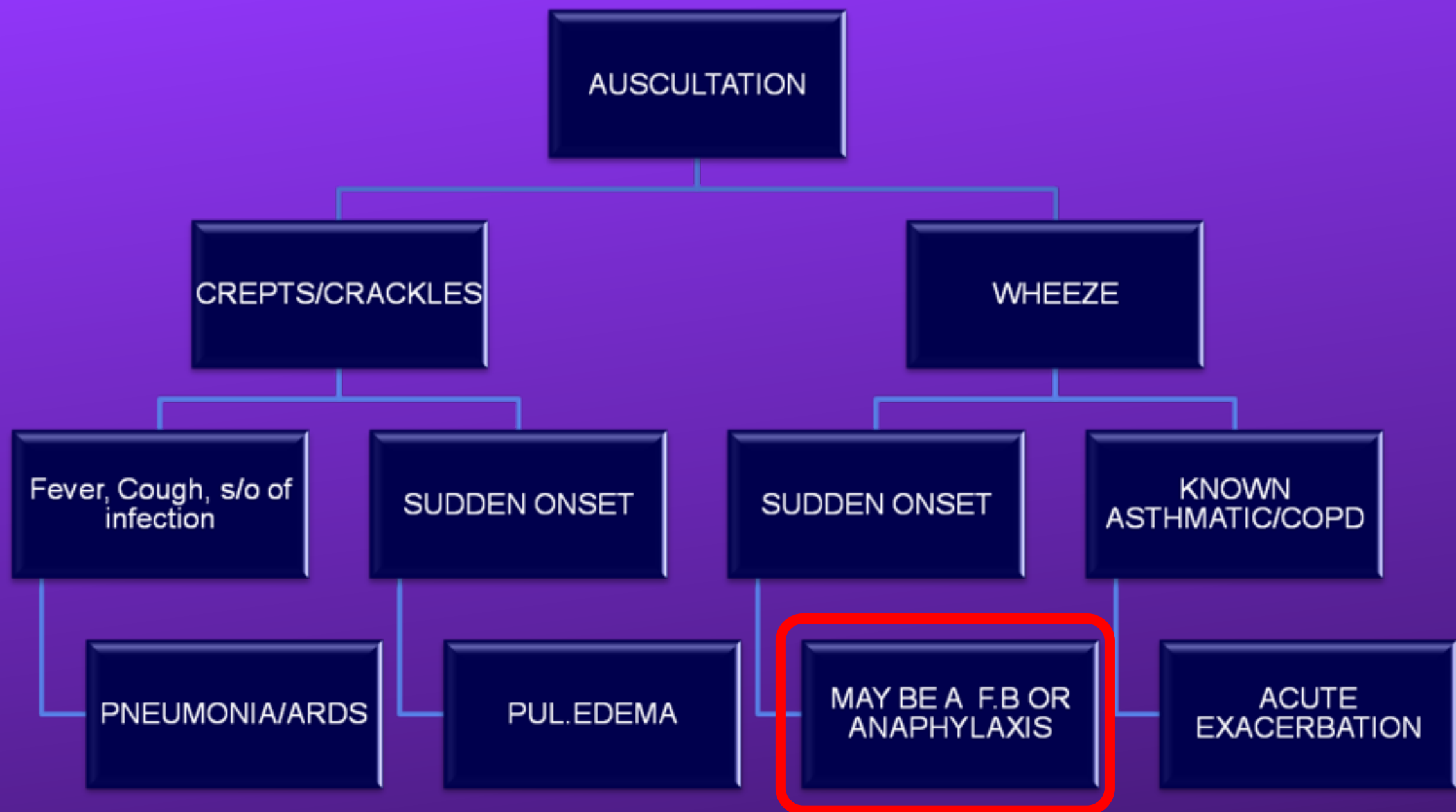






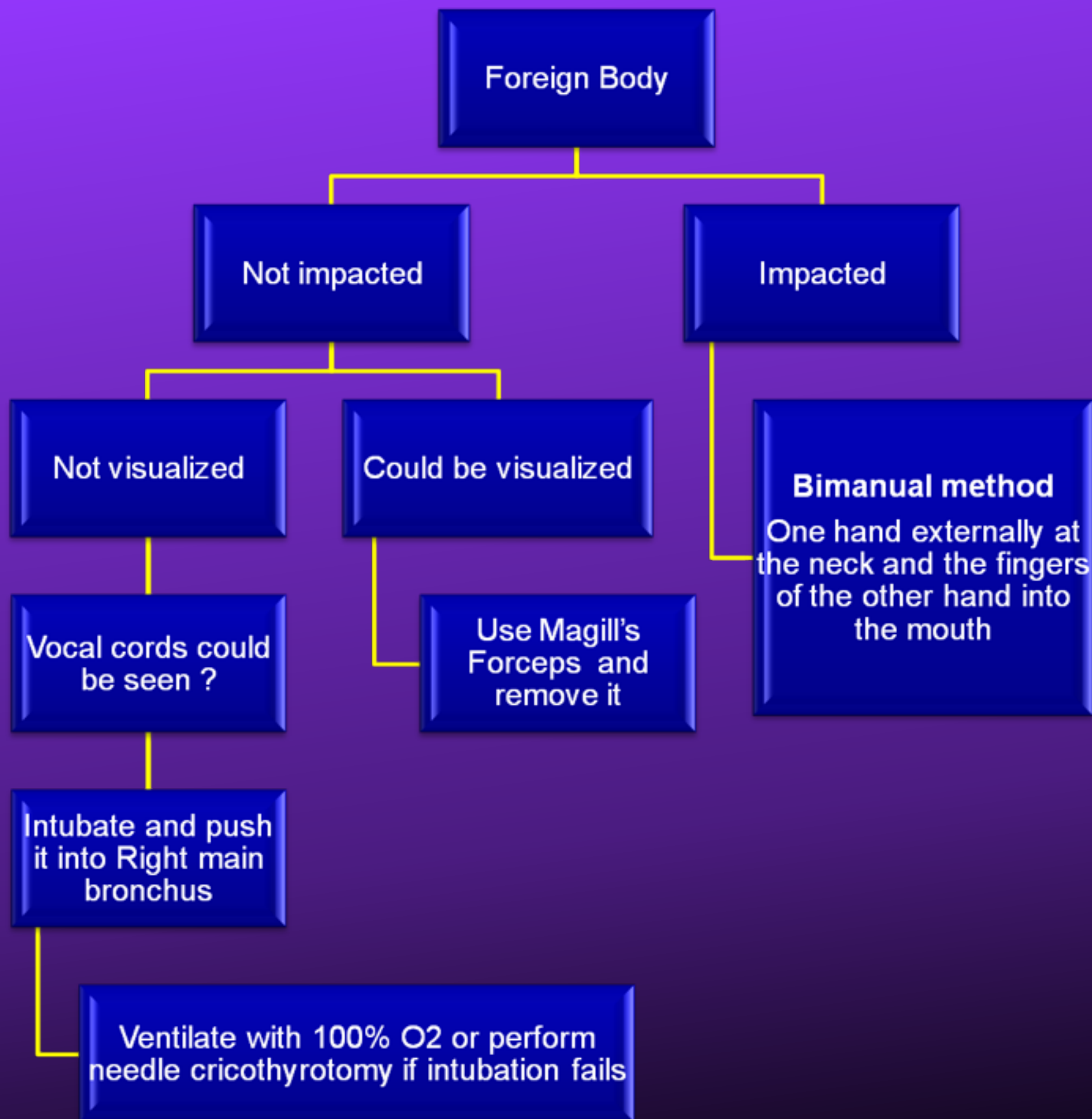
PUL. EDEMA MANAGEMENT

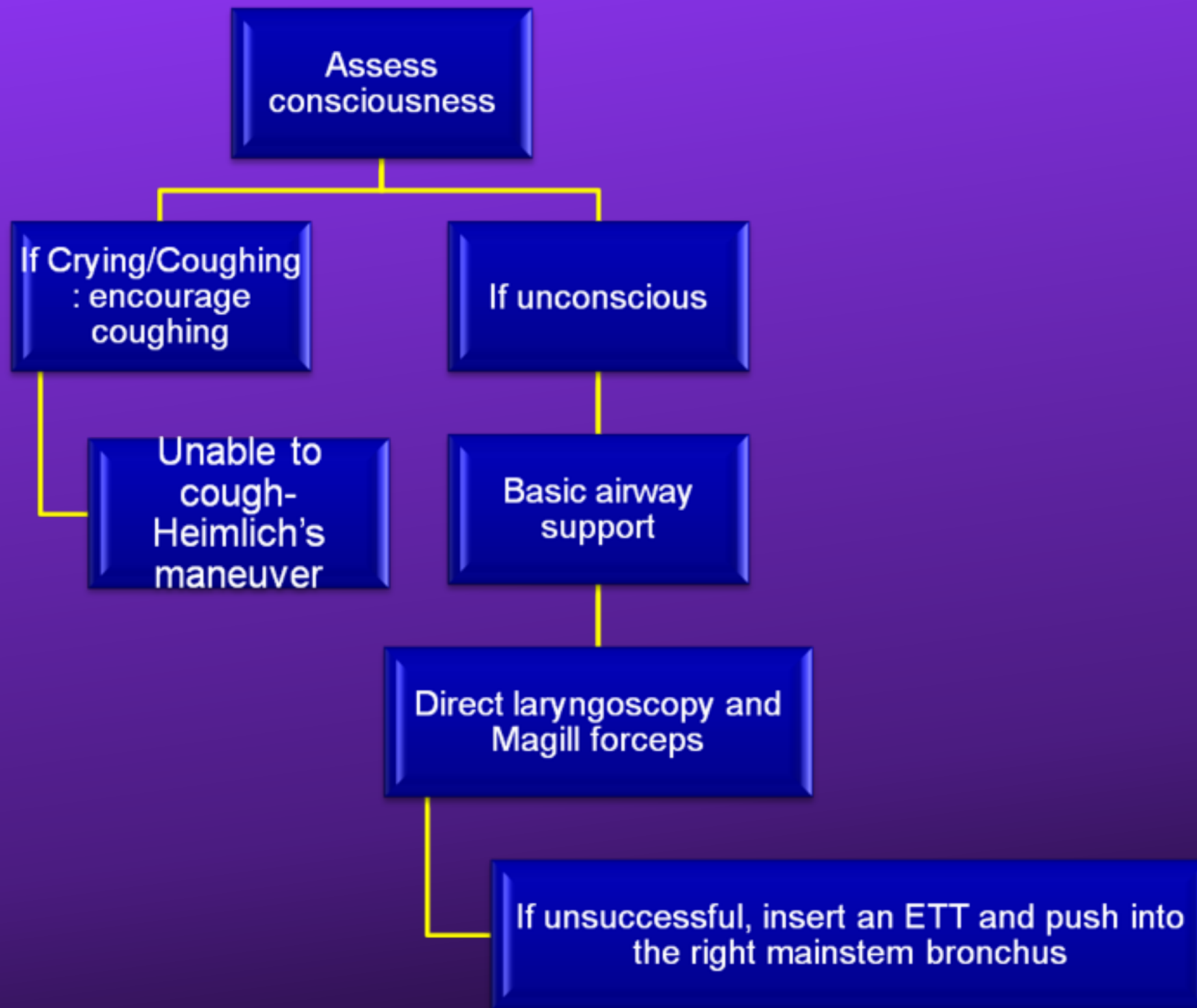


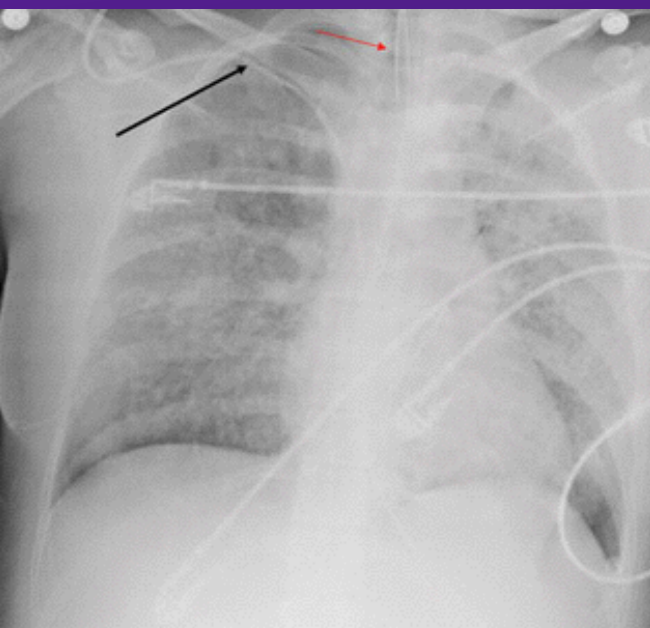
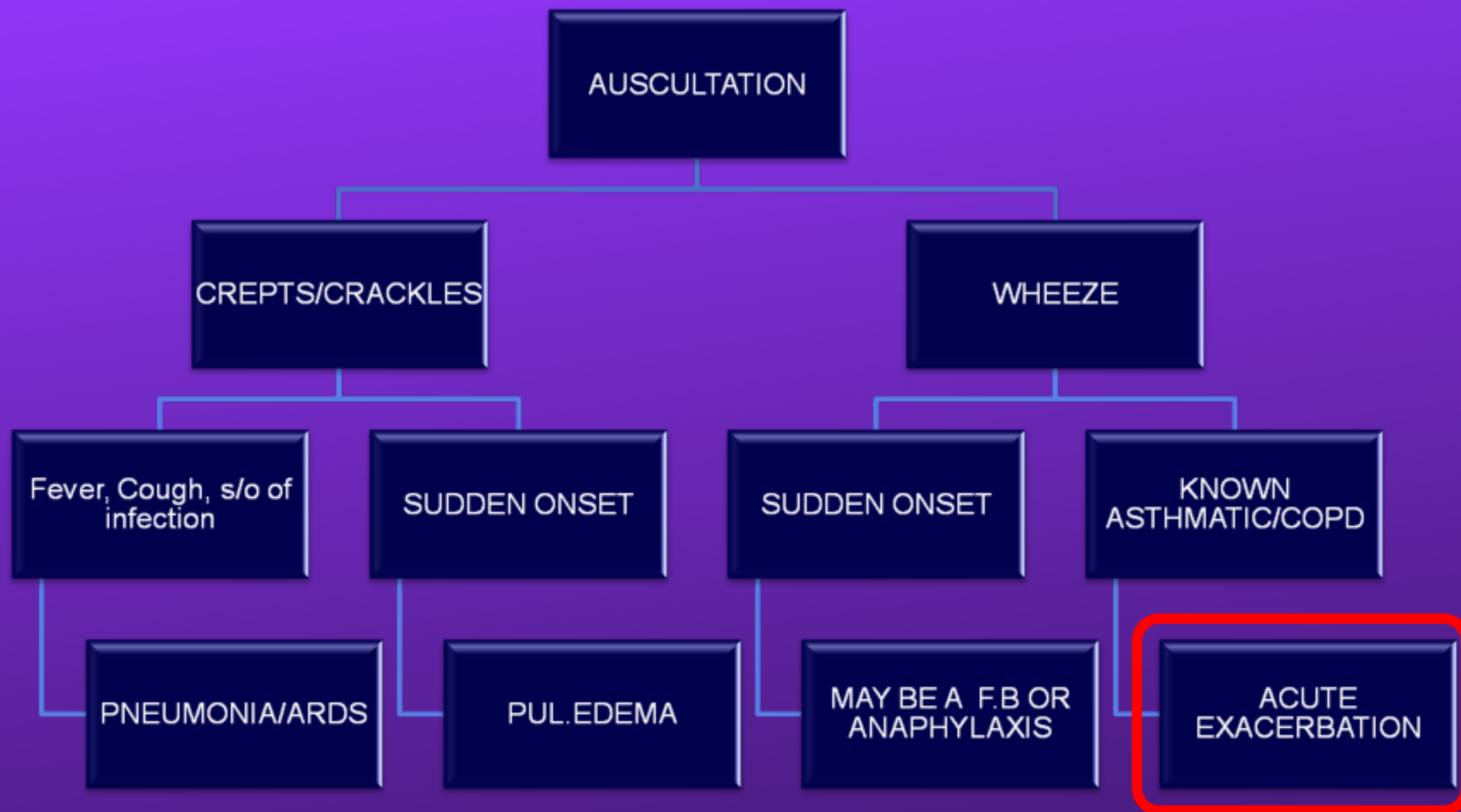




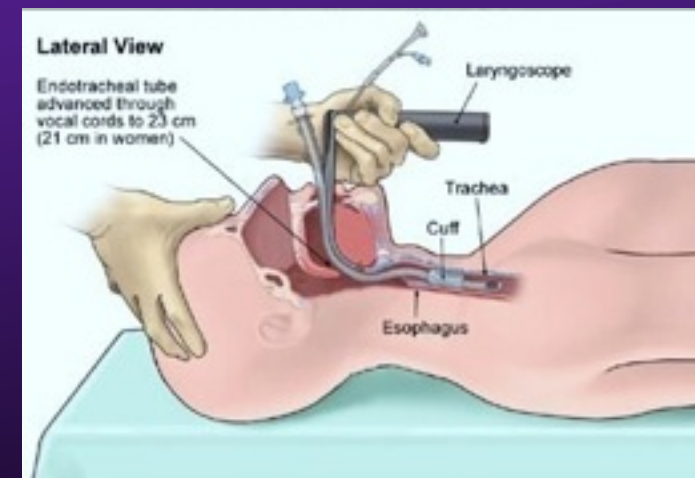
The Heimlich maneuver

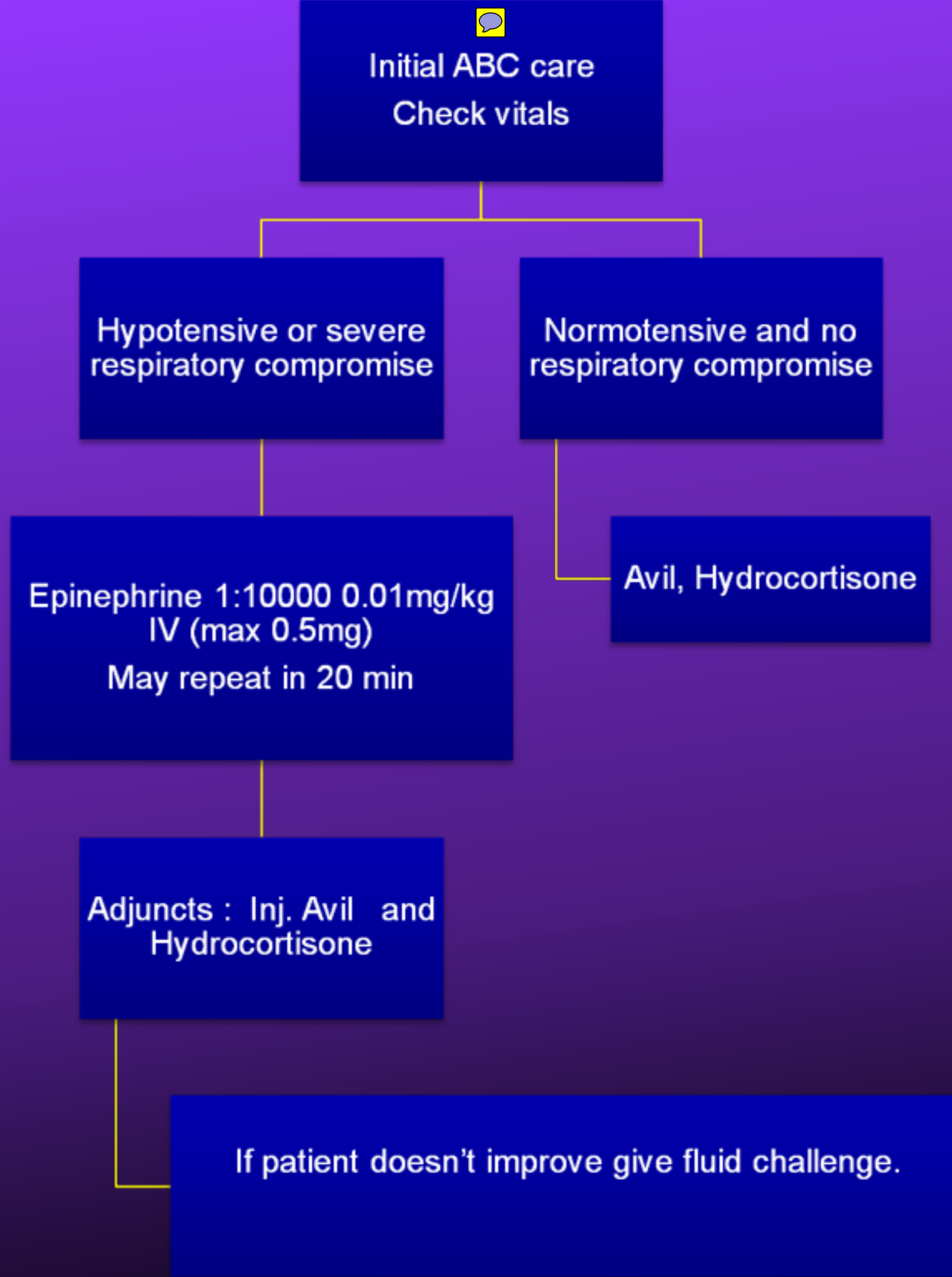






TREATING ASTHMA

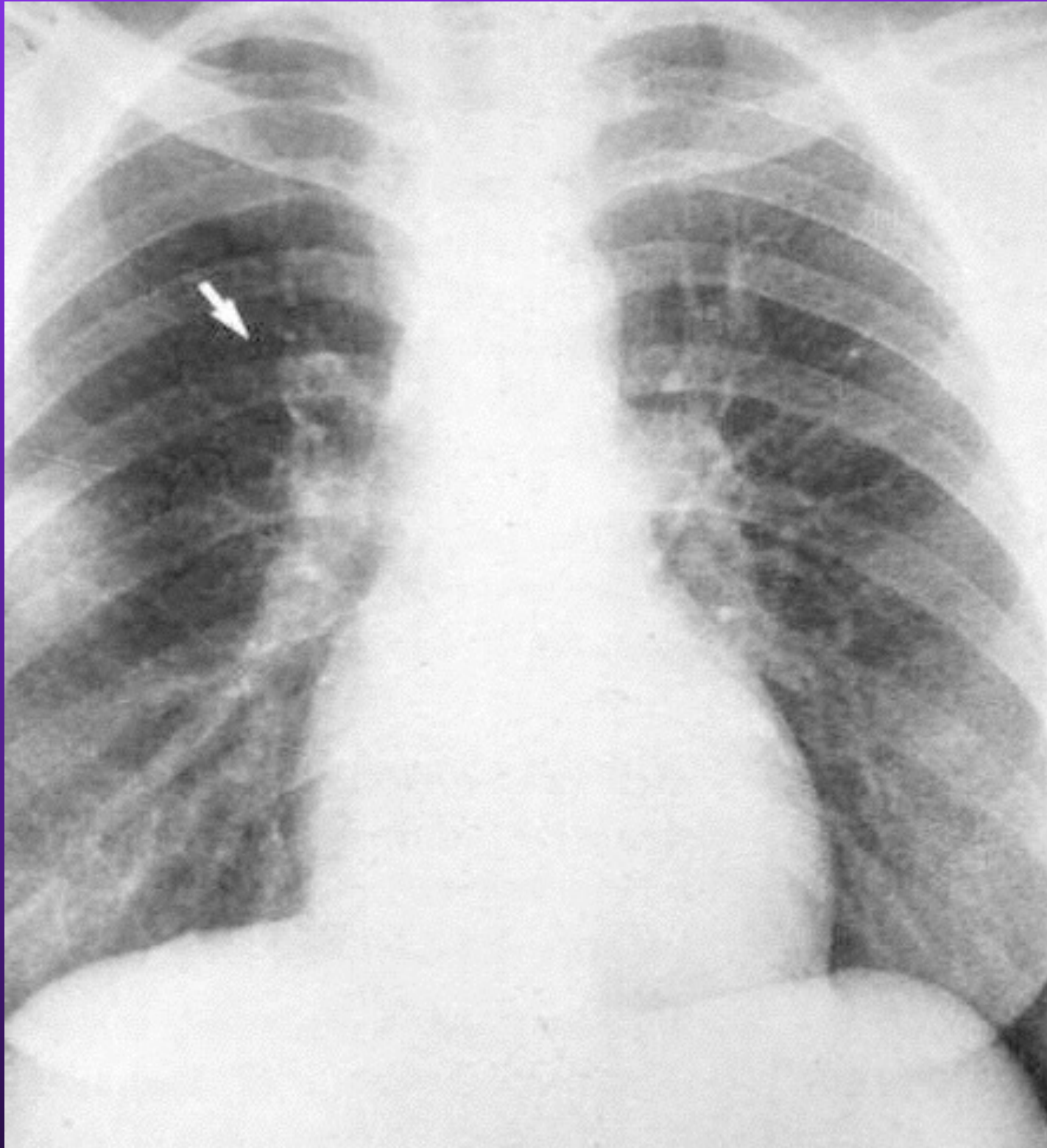




ANGIOEDEMA

Unexplained tachypnoea,
tachycardia,
Hypoxia –Suspect PTE

PULMONARY EMBOLISM



FLEISCHNER'S SIGN

local widening of pulmonary artery due to distension from clot.

WESTERMARK'S SIGN

darker area of reduced perfusion

HAMPTON'S HUMP

segmental pleurally based wedge shaped opacity representing a pulmonary infarct.

BREAK THE BLOCK



Enoxaparin 1mg/kg twice daily



Warfarin started at 5mg/day .
can go upto 7.5 or 10mg/day



100mg of tPA as continuous peripheral iv infusion
for 2 hrs :
15mg bolus and 85 mg infusion x 2hrs

ACUTE SALICYLATE INTOXICATION



Ingestion of less than 150 mg/kg may produce "mild" toxicity, with nausea, vomiting, and GI irritation

ACUTE SALICYLATE INTOXICATION

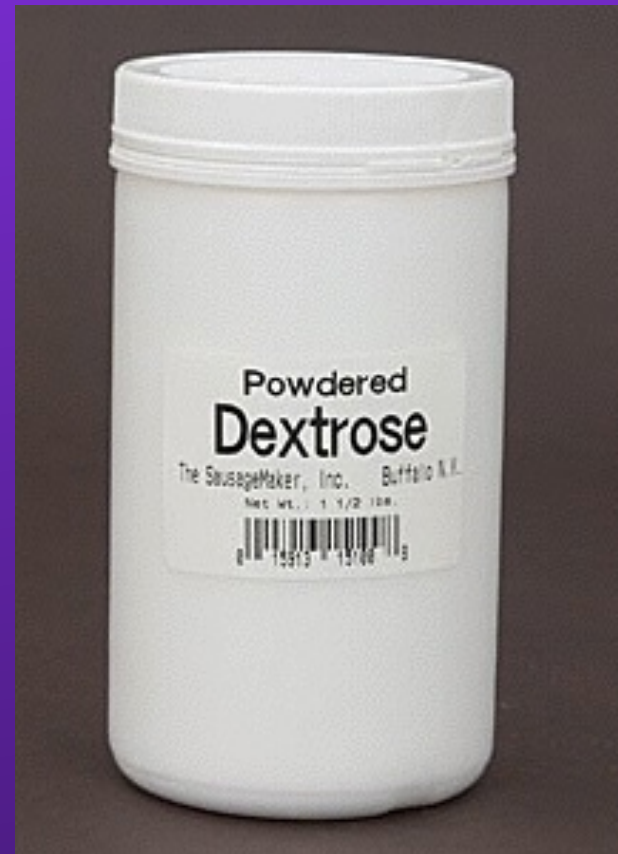


Ingestion of 150 to 300 mg/kg may produce "mild to moderate" toxicity, with vomiting, hyperpnea, diaphoresis, tinnitus, and acid-base disturbances.

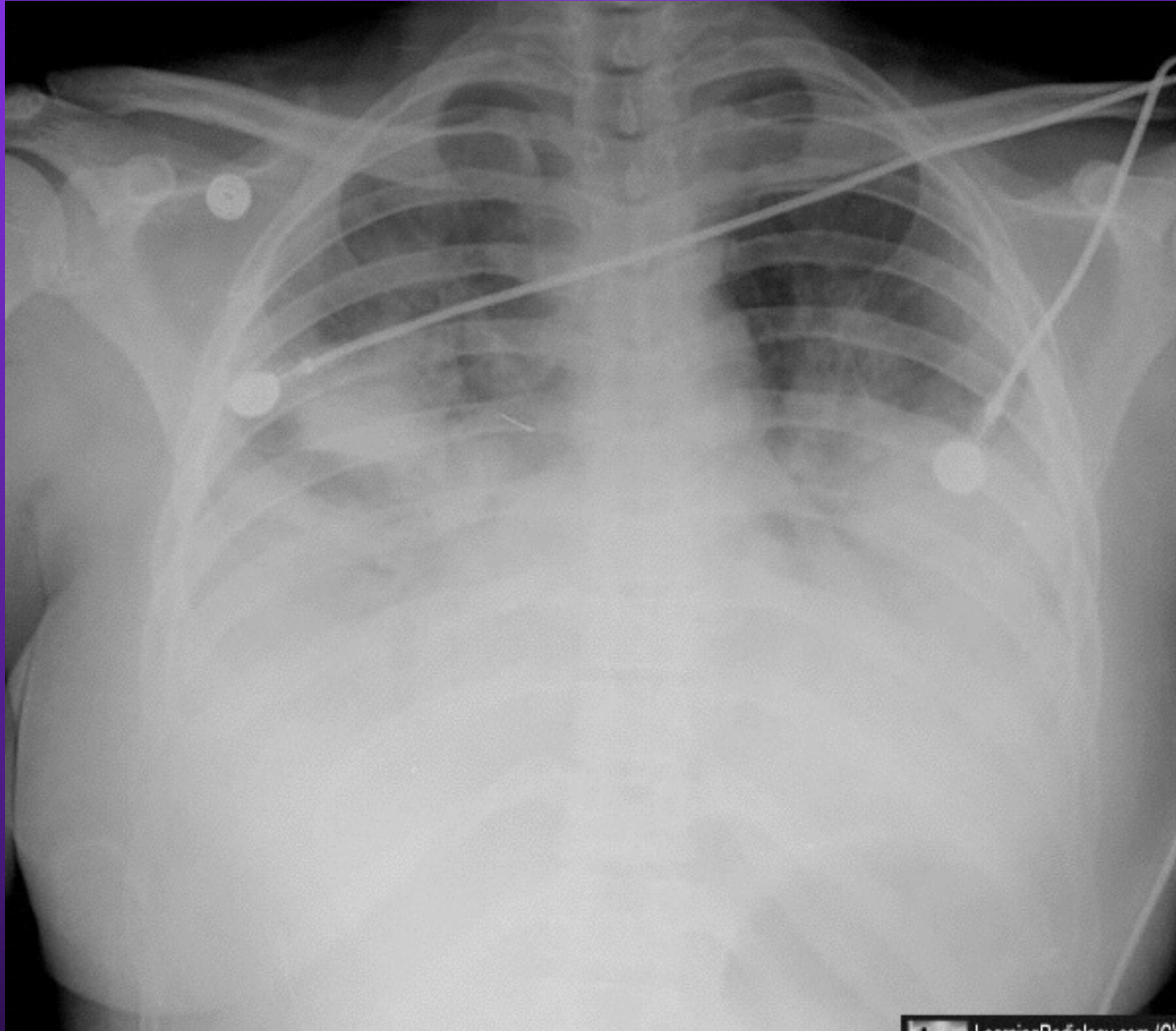


Acute ingestion of more than 300 mg/kg may produce "severe" toxicity.

LETS ANNIHILATE SALICYLATE!!!

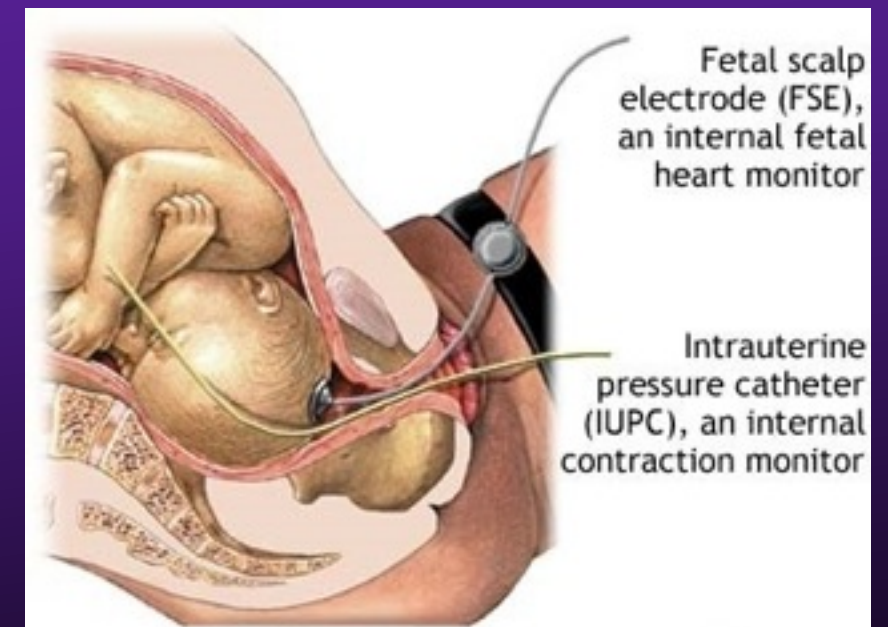


AMNIOTIC FLUID EMBOLISM

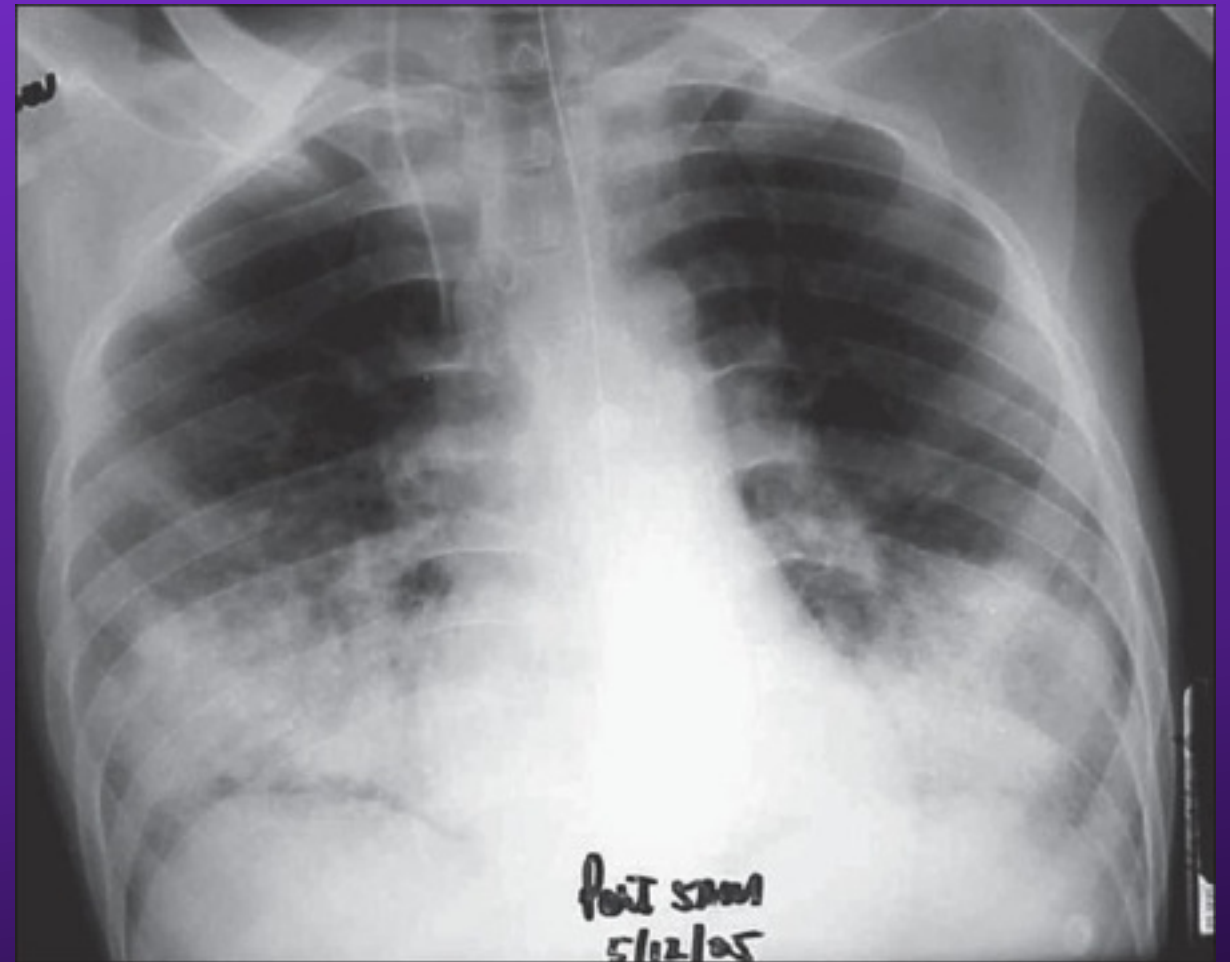


AMNIOTIC FLUID EMBOLISM

- **Phase I**, pulmonary artery vasospasm with pulmonary hypertension and elevated right ventricular pressure cause hypoxia. Hypoxia causes myocardial capillary damage and pulmonary capillary damage, left heart failure, and acute respiratory distress syndrome
- **Phase II**. This is a hemorrhagic phase characterized by massive hemorrhage with uterine atony and DIC; however, fatal consumptive coagulopathy may be the initial presentation.
- If platelets are less than 20,000/ μ L, or if bleeding occurs and platelets are 20,000-50,000/ μ L, transfuse platelets at 1-3 U/10 kg/d



LONG BONE FRACTURE



FAT EMBOLISM

Gurd's Major Criteria: -

Axillary or subconjunctival petechia - occurs transiently (4-6 hours) in 50-60 % of the cases; - hypoxemia (PaO sub 2, <60 mmHg; FiO sub 2, <= 0.4) - central nervous system (CNS) depression disproportionate to hypoxemia, and pulmonary edema; -

Gurd's Minor Criteria: -

Tachycardia (more than 110 beats per minute) - pyrexia (temperature higher than 38.5 degrees) - emboli present in retina on funduscopic examination - fat present in urine - sudden unexplainable drop in hematocrit or platelet values - increasing sed rate; - fat globules present in sputum; -

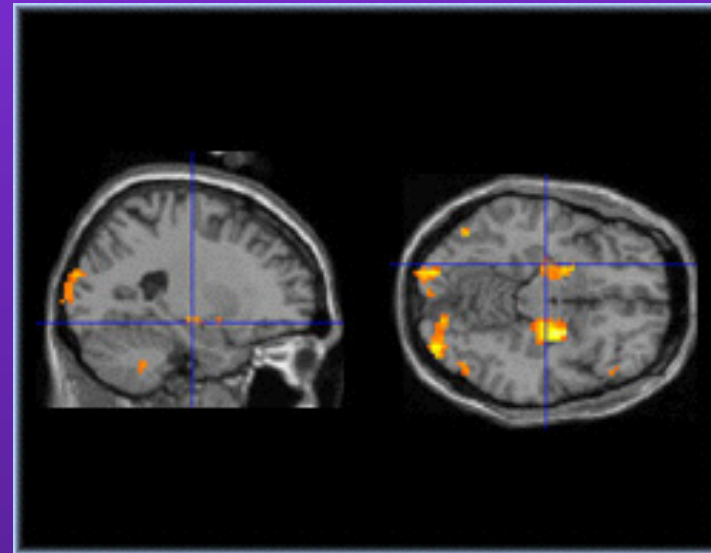
Misc: -

Occurs w/in 72 hours of skeletal trauma; - shortness of breath; - altered mental status; - occasional long tract signs and posturing; - urinary incontinence

SURE IT IS FES?



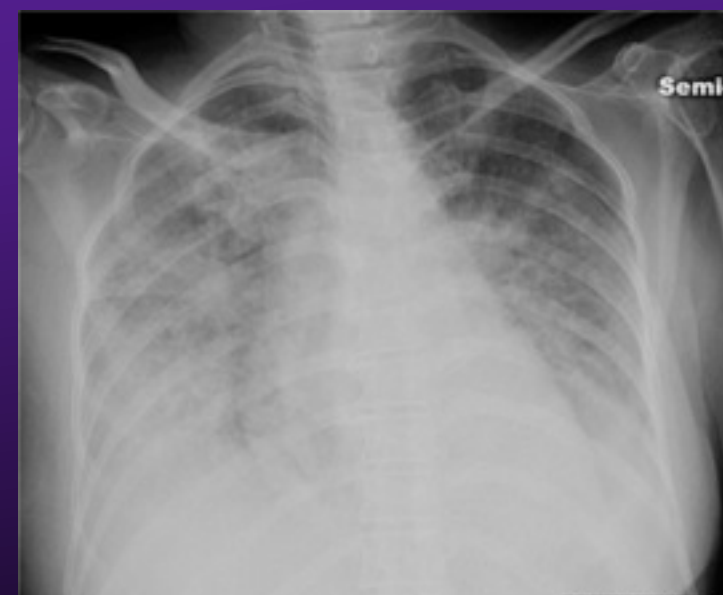
Subconjunctival
petechiae



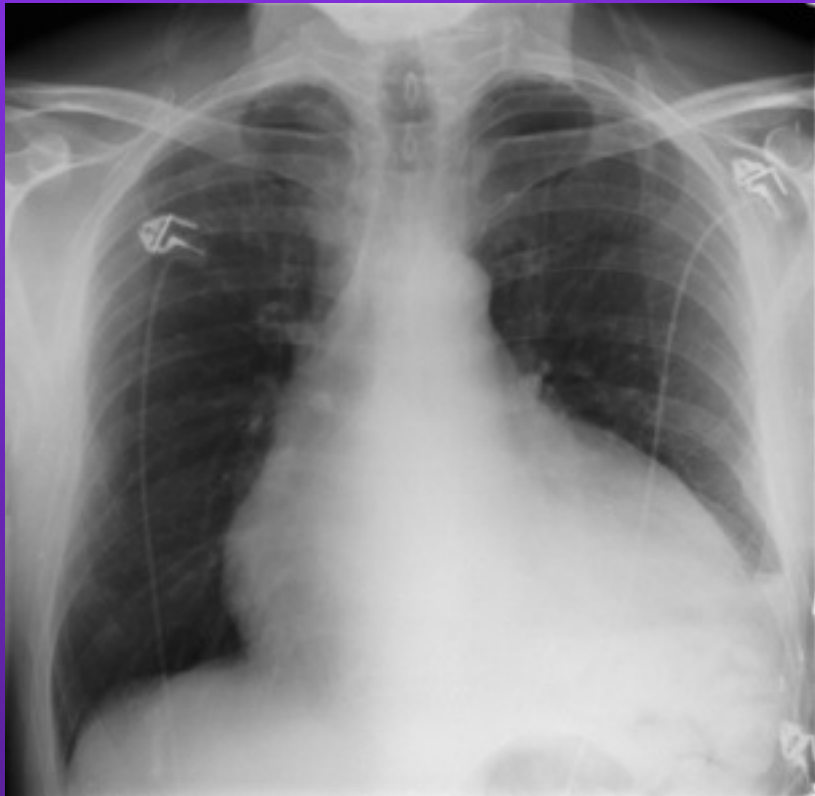
CNS depression



Hypoxemia



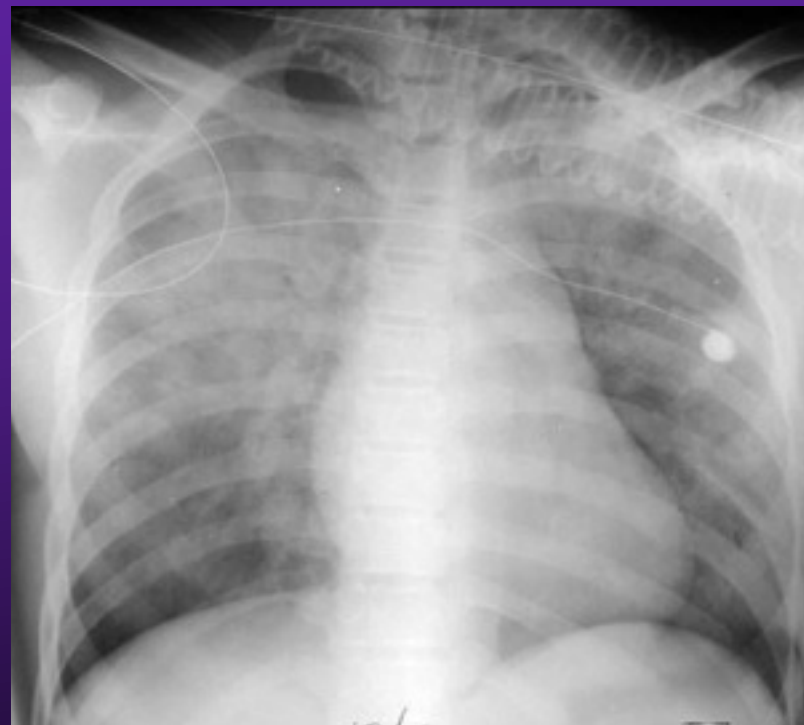
CRF



PERICARDIAL
EFFUSION



PLEURAL &
PERICARDIAL
RUB



PUL. EDEMA



Progressive weakness

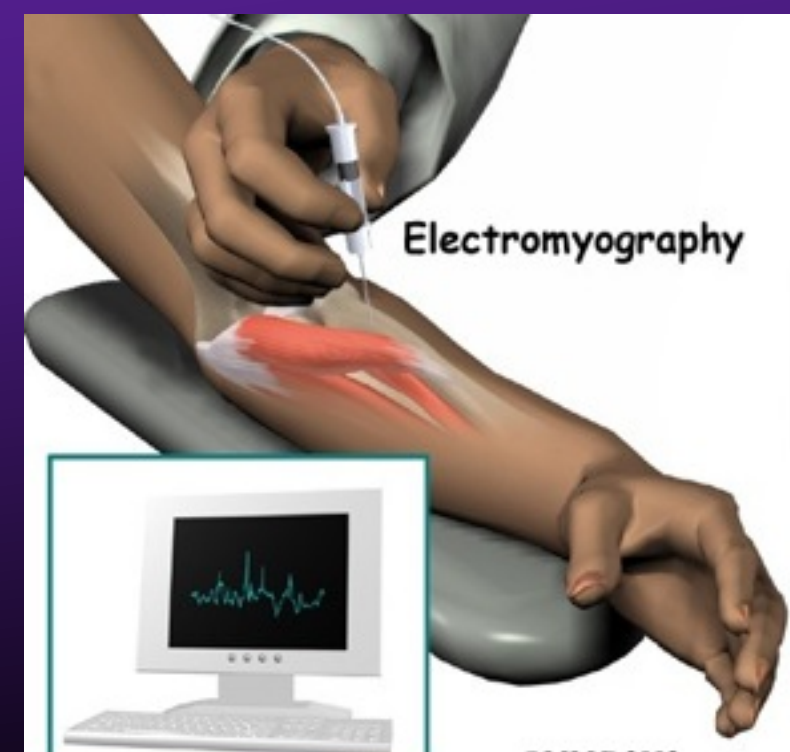


Areflexia

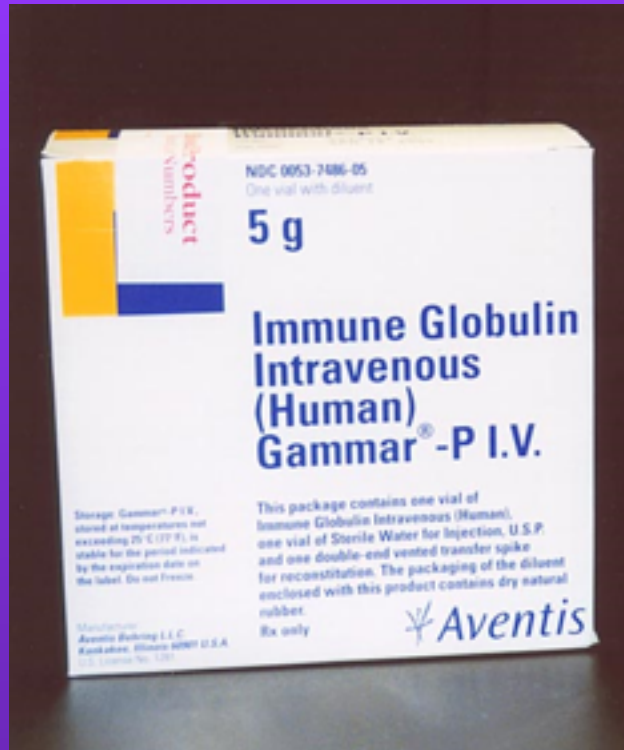
G B S

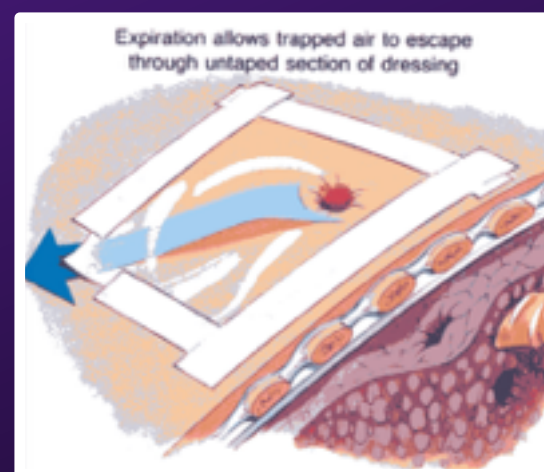
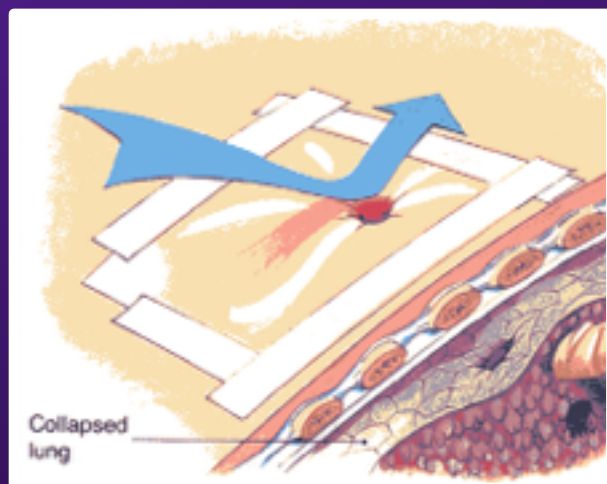
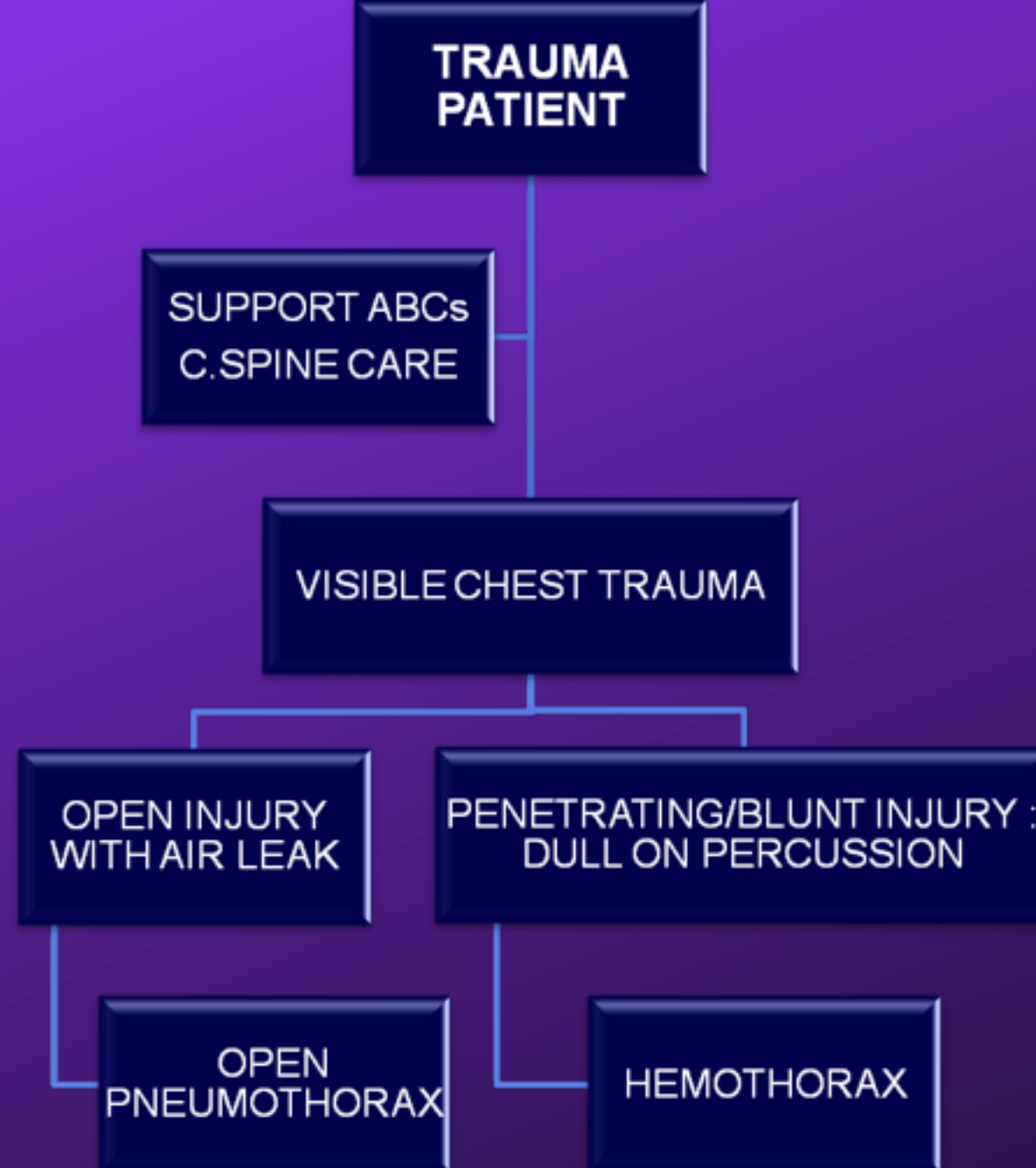


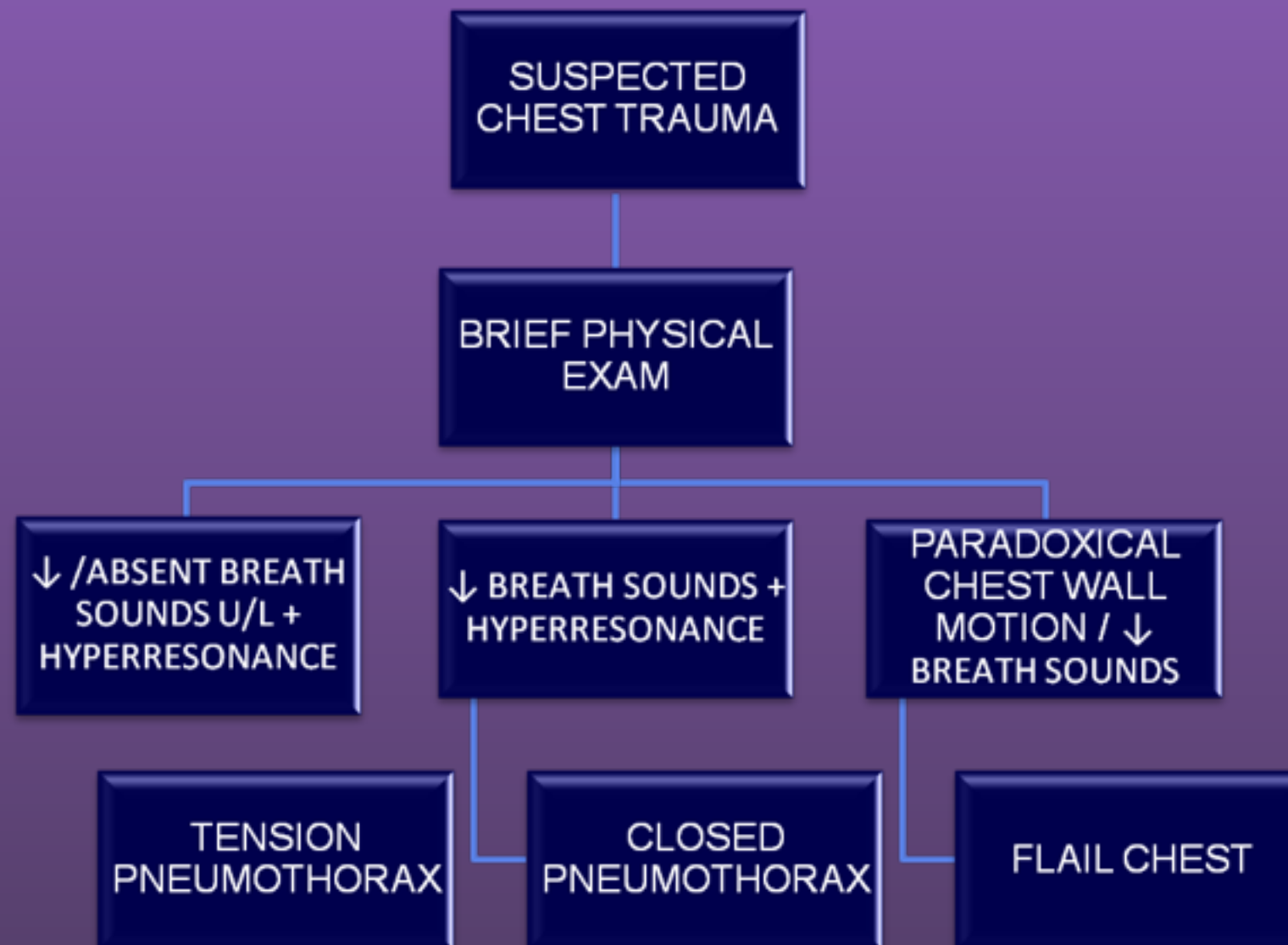
Evidence of demyelination



CSF profile (acellular, increase in protein level)







Spectrum of Dyspnea & Respiratory Syndromes

“Normal” CXR/CT

- Asthma
- COPD & emphysema
- Occupational “asthma-like” syndromes
- Cardiac causes
- Upper airway disease
- Pulmonary vascular disease
- Neuromuscular disease
- Other (anemia, obesity, deconditioning)

Abnormal CXR/CT

- Acute pneumonia syndromes, alveolitis
- Chronic fibrotic diseases (IPF, CVD, sarcoid)
- Pneumoconioses
- Malignancy
- Cardiac disease
- PE
- Other

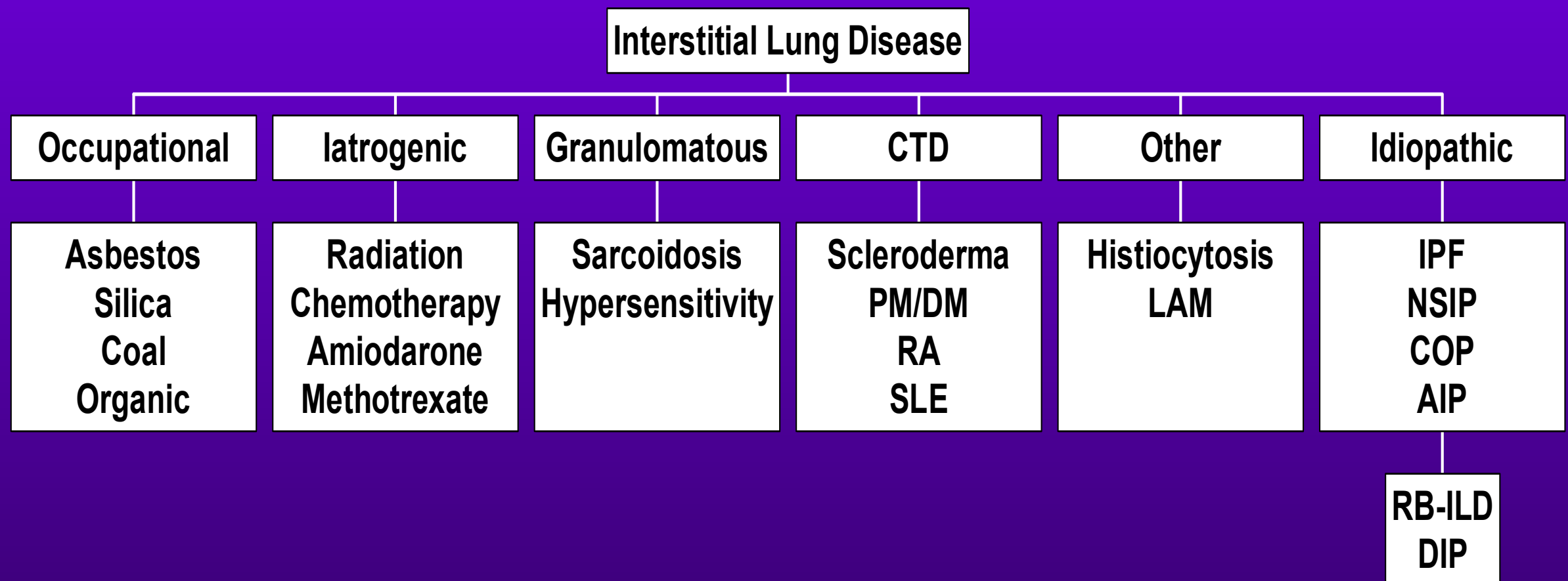
Spirometry

- Two main measurements:
 - total volume exhaled (**FVC**)
 - lung/thorax expansion
 - HPP, IPF - restrictive lung diseases
 - volume exhaled in 1st second of exhalation (**FEV1**)
 - airway diameter
 - obstructive lung diseases
 - » asthma, emphysema, chronic bronchitis, etc.

Asthma "Mimics": Differential Diagnosis

- Overlapping airway disorders
 - Chronic bronchitis and emphysema (COPD)
 - Cystic fibrosis
 - Bronchiectatic syndromes
- Anatomical airway obstruction
 - Foreign bodies
 - Laryngospasm, edema
 - Vocal chord paralysis
 - Laryngotracheobronchomalacia
 - Benign / malignant endobronchial tumors
- Other conditions associated with wheezing
 - Congestive heart failure ("cardiac asthma")
 - Pulmonary embolism
 - Aspiration (gastroesophageal reflux)
 - Loffler's syndrome
 - Factitious asthma (vocal chord dysfunction)

Helpful Classification



köszönöm ! תודה děkuji

mahalo 고맙습니다

 *thank you* 

merci 谢谢 *danke*

Eυχαριστώ شکرا

どうもありがとう *gracias*